ARCHIVES OF OPHTHALMOLOGY.

THE ORDER OF DEVELOPMENT OF COLOR PERCEPTION AND OF COLOR PREFERENCE IN THE CHILD.[1]

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Introduction.

A THEORY as to the order in which perception of colors was acquired by the human race in its development was offered years ago by Gladstone. In his *Studies on Homer's Perception and Use of Colours* (1858), Gladstone announced that in the Homeric poems terms which were supposed to express color, in reality seemed to express rather a system of light and dark than a system of color. One of the curious ideas in Goethe's *Farbenlehre* appealed to Gladstone, since it indicated a point of likeness to Homer, for Goethe also had a scale between light and non-light. "Next to light," said Goethe, "a color appears which we call yellow; another appears next to the non-light which we call blue; mixed equally they form red." Magnus, examining other ancient writings, such as the Hebrew scriptures, the Vedas, and the Zend-avesta, found that words supposed to denote color were used as loosely in these writings as in the Homeric poems. And the theory was then fully launched that archaic man had no perception of color, but recognized differences in luminosity alone; later, man acquired perception of red, orange, and yellow, which Gladstone and Magnus loosely classed as the more luminous colors; and, finally, man came to know green, blue, and violet,

[1] (Read in abstract before the Ophthalmological Section of the New York Academy of Medicine, April 15, 1900.)

which were considered to be the less luminous colors. Homer, Gladstone believed, had got, after a fashion, his red and orange; but the child of three in the nursery to-day was supposed to have a wider perception of color than had the keenly observant Greek poet.[1]

Such was the Gladstone theory, in proof of which little has been offered, and in opposition to which much has contemptuously been said.

To-day the trend of evolutionary investigation has changed, and attention has been turned from following the course of the changes which occur in the species, to the task of tracing the course of the changes, more or less analogous, which occur in the development of an individual animal or a single cell. So now child study is generally indulged in, and, as might be expected, there have been published various accounts of color experiments on children, most of which have been carried on for a period of several months with a single child as a subject. But scarcely in any two of these accounts has the experiment employed had the same purpose or the children the same age, and the results naturally are hopelessly confusing. Furthermore, we believe that none of the tests used was adapted for determining whether the infant actually perceived colors or not.

Preyer was the first to undertake extensive experiments in this regard. In his book *Die Seele des Kindes* (1881), he records the results of experiments carried on for more than twelve months with a single infant, beginning at the end of the second year of life. His procedure was to show the child a few colors and teach him their names, new colors being added from time to time, and later to ask the child to pick out a color which he named or to name a color which he picked up. The greatest percentage of correct responses was for yellow, then for brown, red, violet, black, rose, orange, gray, green, and blue, in the order named.

Miss Shinn [*Notes on the Development of a Child* (University of California Studies), p. 49] made somewhat similar tests with an infant of eighteen months, and obtained quite different results.

[1] Gladstone, "The Color Sense," *The Nineteenth Century*, vol. ii., p. 366, 1877.

Binet (*Revue Philosophique*, xxx., p. 583) separated Preyer's two procedures, recognizing them to be tests for quite different ends, and with a child of thirty-two months made one series of experiments in which the child was urged to select a color that was named, and another series in which the child was urged to name a color selected. The results, tabulated separately, differed in each case from those reported by Preyer.

Baldwin then described in his book on *Mental Development* what he called a dynamogenic method of studying responses to various stimulations, which was to obviate all the difficulties of earlier methods. He experimented with an infant from the beginning of the ninth month, by placing bits of colored blotting-paper, one at a time, at different distances from the infant and noting the frequency of reaction to the different colors at different distances. His results were expressed in a formula in which "the strength of dynamogeny," D, was equal to $\frac{c}{d}$; c being the color and d its distance from the infant. He found the order of attractiveness to be blue, white, red, and green; yellow not having been used. His method, however, has been criticised adversely by reviewers and his results in no way agree with our own. Besides these, there are many less pretentious observations scattered through the literature which we need not discuss here.

In an attempt to clear up this confusion we examined by tests that appeared suitable more than two hundred children of various ages selected from among the brightest and least shy inmates of a dozen nurseries, hospitals, and asylums in New York, and we wish here to express to the officers of these institutions our appreciation of their kindness in affording us all the facilities desired.

I.

THE ORDER IN WHICH COLOR PERCEPTIONS ARE ACQUIRED.

It is evident that up to this time no one who has studied color perception in young infants has used a test by which it was possible to demonstrate that the infant actually per-

ceived particular colors, for in every case in which an infant reacted to a colored object it could not be proven that the reaction was not due to the difference in luminosity between the test object and the background rather than to the particular hue of the test object. For a reliable test of color perception in young infants, difference in luminosity between the colored object and the neutral background must be eliminated. This point may be explained as follows: Let, for example, a square of light red paper be laid upon a background of dark gray. The square will differ from the background both in hue and luminosity, *i. e.*, both in color and in brightness. If a person who from disease has lost perception of red views this square of red paper, or if a person with normal eyes views it indirectly so that its image falls upon the periphery of the retina, which normally does not perceive colors, the red hue will not be perceived and the red square will appear gray. But the gray in this case will appear lighter than the dark gray of the background, and hence the square will be recognized, just as a light gray square on a dark gray background would be recognized by the normal eye.

When, however, we place a square of red paper upon a gray background of exactly the same luminosity, the red-blind eye will perceive the red square as neutral gray, lying on a background of similar gray, and, if the square has not a perceptible outline, the background will appear of a uniform gray, and the presence of the square will not be recognized.[1] Therefore, when a square of red paper on a gray background of the same luminosity is recognized by an eye, we know that the eye perceives red.

THE TEST.

The test we used for determining the earliest perception of a color in young infants consisted in presenting to the infant a piece of tissue paper of that color 15 *mm* square, upon

[1] The effects of viewing a colored object on a gray background of the same luminosity have been described in detail in the paper by Holden: The fluttering produced by the juxtaposition of certain colors and of black and white.—These ARCHIVES, xxvii., 1.

a background of gray paper having the same luminosity as the colored paper, and observing whether the infant made an effort to grasp the colored square. If it made an effort to grasp the colored square it must have perceived that color.

It is difficult to prepare a gray background having exactly the same luminosity as a given color, and, furthermore, the colors themselves, especially violet, vary greatly in relative luminosity under different degrees of general illumination. Therefore, it is expedient to use a large sheet of gray paper which is graduated, being dark gray at one end and light gray at the other. The so-called Rembrandt mounts now popular with the photographers are well adapted for this purpose. By shifting the colored square from one end of the gray sheet toward the other end, it is possible for the practised eye, with the lids somewhat pinched together, readily to discover a point at which the gray background has exactly the same luminosity as the colored square which lies upon it. Tissue paper was used for the squares because it can be obtained in colors corresponding closely to the colors of the spectrum and because the thin margins are scarcely perceptible.

Tests with young infants are successful only when the subject is wide-awake and in good humor, and when it is accustomed to seeing new objects and new people. The infants in asylums are apt to be shy. Still, we obtained reliable records of tests with thirty infants between six and twelve months of age. The routine method was as follows:

A large sheet of graduated gray paper was laid upon a sheet of stiff cardboard and the dark end held before the infant. Several pieces of white paper of different sizes were placed successively on the dark gray and the infant was urged to pick them up. After the infant had entered into the spirit of the test a flat piece of red tissue paper 15 *mm* square was laid upon the dark end of the gray sheet, and when the infant grasped for it, the sheet was withdrawn and the square of red paper pushed along until it lay upon a gray of equal luminosity as seen from the infant's view-point. If, when the sheet was presented again, the infant grasped

for the red paper, it was recorded as having perception for red. If a positive result was obtained with red, the other spectral colors were tried in succession, the test being stopped whenever the infant became inattentive or the reactions doubtful. If some colors caused a reaction while others did not, control tests were made after an interval or on another day. In infants that soon showed signs of fatigue, subsequent tests began with blue or violet for reasons that will appear later.

THE RESULTS OF THE TEST WITH THIRTY INFANTS BETWEEN SIX AND TWELVE MONTHS OF AGE.

The results may be stated in a few words. Before the age of six months definite reactions were not obtained. With precocious infants of six months and average infants of seven or eight months a prompt reaction was usually obtained to red, orange, and yellow, but as regards green, blue, and violet there was considerable difference in different infants. In some infants no reaction at all could be obtained to these colors; in others there was, after repeated efforts, a sluggish and uncertain reaction to all; and in a few a reaction was obtained to all except blue. With infants of nine months there was usually prompt reaction to red, orange, and yellow, and more sluggish reaction to green, blue, and violet. With infants between ten and twelve months there was often equally prompt reaction to all colors. When the test results positively it means that the color is perceived as differing from gray. When the test results negatively it may mean either that the color cannot be distinguished from gray or that the color is not attractive to the infant. As we shall see later, when preference tests are discussed, green, blue, and violet are not attractive to young infants, so it is probable that the failure to react promptly to these colors was in part due to a lack of interest in them, although it seems true also that the perception of colors of the red end of the spectrum, of long wave length, is acquired a little earlier than the perception of colors of the violet end of the spectrum, of shorter wave length.

Generalizing, we may say that the precocious infant may perceive and react to all the colors of the spectrum as early as the seventh month, and that the average infant will perceive and react to them all by the tenth month, the colors of the red end of the spectrum being reacted to a little earlier than the colors of the violet end.

II.

COLOR PREFERENCE, OR THE ORDER OF ATTRACTIVENESS OF COLORS, AT DIFFERENT AGES.

To determine the order of attractiveness of colors, ribbons of the six fundamental spectral colors: red, orange, yellow, blue, green, and violet, were offered to the child, who was urged to pick them up one at a time. Some of the children unquestionably exercised choice, and were recorded as responding positively to the test, while others picked up the ribbons in sequence or at random, and were recorded as responding negatively.

For the purpose of rendering the complex tabulated results more comprehensible we will first present the general results in outline.

It was found that all those infants between seven and twenty-four months of age who were recorded as responding positively, picked up red first, orange and yellow second or third, and green, blue, and violet, fourth, fifth, or sixth. In other words they selected the colors approximately in the order of the spectrum, beginning at the red end. It was found also that in the first age group, seven to fifteen months, almost all the infants positively exercised choice. In the second age group, sixteen to twenty-four months, only about one quarter of all the infants responded in a positive manner. In the third age group, two to three years, the percentage of children exercising choice diminished still more, it being found in only three out of twenty-six. Two of these three still selected the colors very closely in the order described for the previous groups, while the third selected them in almost exactly the opposite direction of the spectrum, beginning with blue and ending with red.

In the fourth age group, three to four years, there was again a greater percentage of children positively exercising choice, but only one chose the colors beginning with red, while many others began with blue. About an equal number exercised what we may call "atypical choice," which will be described later on. In the next four age groups, from four to eight years, the percentage of children with positive choice increased steadily. There was a steady increase also in the number of children who began their selection at the blue end of the spectrum and ended it at the red. Only an isolated instance of red preference occurred during this period, and the atypical cases decreased to about seven per cent. Thus blue preference became almost universal at the age of eight.

The last age group, eight to thirteen years, presented about the same features as were shown at the end of the preceding group. A slightly higher percentage of children exercised positive choice, and this was almost without exception blue preference.

The order of blue preference underwent certain intrinsic changes with advancing age which will be mentioned later.

THE TEST.

As colored test objects we used satin ribbons, one inch wide and a foot long, corresponding closely in hue and relative luminosity to the six fundamental spectral colors. The ribbons were placed side by side, an inch apart, upon a sheet of medium gray pasteboard. No particular rule was observed in arranging the different colors except to alternate a color near the blue end of the spectrum with one near the red end, and to avoid putting the duller colors at the ends of the row. With the ribbons arranged in this way, all portions of the test field attracted the attention about equally. An inch space between the ribbons was sufficient to allow each color to stand definitely by itself and to make it impossible for the child to grasp more than one ribbon at a time.

The cardboard on which the ribbons were placed so that they pointed towards the child was held about a yard away

and brought quickly into reaching distance, while the child was urged to pick up the ribbon it liked best. The ribbon chosen first was taken away from the child, and the rest brought together to fill the gap and again presented. This procedure was repeated until all the ribbons but one had been picked up. The order was noted by recording in a line the initial letters of the colors as they were selected.

We have already mentioned what we have called positive and negative responses to the test. The distinction was made as follows: The child who responded positively, showing actual choice, would look over all the ribbons critically and deliberately select one. When this was taken away and the remaining ribbons presented, there would be a critical selection of a second ribbon, and so on. When such a child was put through the test several times in immediate succession it soon began to pick up the ribbons at random. Hence the results of the first tests only were recorded or, if we wished to verify the first results, the subsequent tests were made after a considerable interval or on other days, when the later results would be found to agree closely with the first.

The child who responded negatively paid little attention to the ribbons, but rather watched the experimenter for suggestions as to choice,—any suggestion, such as pointing towards a ribbon, mentioning the name of a color, or the like, immediately being acted upon; when no suggestions of this kind were given, the ribbons were picked up usually in sequence, beginning with those next to the child's right hand if this hand were used, or with those at the child's left if the left hand were used. Occasionally, one of the ribbons near the centre would be picked up first, and following this the ribbons to one side, and later those to the other, would then be picked up in sequence. If the ribbons were thrown in a heap, the child usually picked up each time the ribbon which was most easily reached. There was naturally no definite order of selection of colors here, and tests on different days always led to widely different results.

After a little observation one usually saw in a moment

whether the response should be classed as positive or as negative, but in doubtful cases the test was repeated.

The cases of atypical choice, mentioned above, are most frequent at the age when red preference is passing through indifference over into blue preference. The child in these cases chose deliberately one color, or at the most two, and was indifferent to all the rest, picking them up in sequence or at random. The colors chosen were always orange, yellow, or green, the middle and most luminous colors of the spectrum. These cases also were classed with the positive results, so that the latter comprise what we shall call: red preference, blue preference, and atypical choice.

Up to the fifth year the percentage of boys examined was about equal to that of girls; after the fifth year the children examined were mostly girls. No difference in responses was noticed that would suggest a sex distinction, and hence both were classed together.

NUMERICAL CLASSIFICATION OF THE VARIOUS KINDS OF REACTION TO THE TEST.

In Table I. are recorded for each age group the number of positive and negative responses and the total number of children examined, and again the percentage of positive and negative responses. Under positive responses are included the three groups: red preference, blue preference, and atypical choice.

The percentage of positive responses (fifth column) is seen to be high in early life—amounting to 81 per cent. in the age group seven to fifteen months. It then drops rapidly to a minimum of 12 per cent. in the age group two to three years; and gradually rises again until it reaches a maximum of 93 per cent. in the age group eight to thirteen years. The table shows a break in the gradual rise when we reach the age group six to seven years. It may be mentioned in possible explanation that the seventeen children in this age group were all in a single institution, where the children were unused to visitors and shy.

TABLE I.

Age Group.	Number of + Responses.	Number of − Responses.	Total Number Examined.	Per Cent. of + Responses.	Per Cent. of − Responses.
7 to 15 months.....	13	3	16	81	19
15 months to 2 years....	5	13	18	28	72
2 to 3 years.....	3	23	26	12	88
3 to 4 years.....	9	18	27	33	67
4 to 5 years.....	7	13	20	35	56
5 to 6 years.....	10	7	17	58	42
6 to 7 years.....	7	10	17	41	59
7 to 8 years.....	17	2	19	89	11
8 to 13 years.....	38	3	41	93	7

In Table II. are recorded the relative percentages of the three varieties of positive choice as found in each age group.

TABLE II.

Age Groups.	Per Cent. of Red Preference.	Per Cent. of Blue Preference.	Per Cent. of Atypical Choice.
7 to 15 months.....	100	0	0
15 to 24 months.....	100	0	0
2 to 3 years.....	67	33	0
3 to 4 years.....	12	44	44
4 to 5 years.....	0	86	14
5 to 6 years.....	0	80	20
6 to 7 years.....	14	57	29
7 to 8 years.....	0	94	6
8 to 13 years.....	0	93	7

It is seen here that red preference is universal in the first two age groups, seven to fifteen and fifteen to twenty-four months. It then rapidly decreases, and has practically disappeared at the end of the fourth year. Only one case of red preference was found after the fourth year, that of a boy in the age group six to seven years. Since in this age group there are only seven positive responses, this anomalous case unduly affects the relative percentages.

Blue preference begins with 33 % in the age group two to three years, and steadily increases to 93 % in the last group. Atypical choice begins with 44 % in the age group three to four years and decreases to 7 % in the last.

The next two tables, III. and IV., require rather more explanation. The vertical columns refer to the order of choice, and the numerals in the horizontal line opposite the initial of a color indicate the number of times that particular color was chosen first, second, third, etc., according to the column in which it stands, in the age group indicated at the right. Thus the first horizontal line of numerals in table III. indicates that of the eighteen children between seven and twenty-four months who responded positively, fourteen selected red first, one selected it second, and three selected it third. Except in the age group two to three years, only a single test of the order of selection was tabulated, since the records of subsequent tests did not alter the character of the results. But in the age group two to three years, there were but two cases of red preference and one case of blue, and, therefore, the results of three trials at long intervals are tabulated in order to make the figures appear more representative. The single case of red preference in the age group three to four years, and the single one in the age group six to seven years, have been omitted from the tables.

TABLE III. (RED PREFERENCE).

	Times Selected First.	Times Selected Second.	Times Selected Third.	Times Selected Fourth.	Times Selected Fifth.	Times Selected Sixth.	Age Group.
R.	14	1	3	..	..	..	7 to 15 and 15 to 24 mos.
O.....	1	6	11	..	..	..	
Y.	3	9	6	..	..	..	
G.	..	..	..	9	6	3	
B.....	..	..	..	..	9	9	
V.	..	..	..	9	3	6	
R.	4	..	2	..	..	..	2 to 3 yrs.
O.....	1	1	2	1	1	..	
Y.	1	4	1	..	..	..	
G.	..	..	..	..	2	4	
B.....	..	1	1	4	..	..	
V.	..	..	..	1	3	2	

TABLE IV. (BLUE PREFERENCE).

	Times Selected First.	Times Selected Second.	Times Selected Third.	Times Selected Fourth.	Times Selected Fifth.	Times Selected Sixth.	Age Group.
R.	..	..	..	..	..	3	2 to 3 yrs.
O.	..	..	1	..	2	..	
Y.	..	..	..	3	..	..	
G.	..	..	2	..	1	..	
B.	3	..	..	..	..	.	
V.	..	3	..	..	..	..	
R.	..	..	1	..	..	3	3 to 4 yrs.
O.	..	..	..	1	3	..	
Y.	..	..	..	2	1	1	
G.	3	..	1	..	..	..	
B.	1	2	1	..	..	..	
V.	..	3	1	..	..	..	
R.	..	..	..	..	3	2	4 to 5 yrs.
O.	..	..	1	1	2	1	
Y.	..	..	1	3	..	1	
G.	..	3	1	..	..	1	
B.	1	1	2	1	..	..	
V.	4	1	..	..	..	..	
R.....	..	..	2	1	3	2	5 to 6 yrs.
O.	..	..	1	2	2	3	
Y.	1	1	1	1	2	2	
G.	..	3	1	2	1	1	
B.	3	1	2	2	..	..	
V.	4	3	1	..	..	..	
R.	..	..	..	..	1	3	6 to 7 yrs.
O.	..	1	2	..	1	..	
Y.	..	..	..	3	1	..	
G.	2	1	..	..	..	1	
B.	..	1	1	1	1	..	
V.	2	1	1	..	..	..	
R.....	..	1	2	5	1	7	7 to 8 yrs.
O.	..	3	..	3	5	5	
Y.	..	..	4	3	6	3	
G.....	1	4	4	4	2	1	
B.	2	7	4	1	2	..	
V.	13	1	2	..	..	..	
R.	3	6	7	11	6	2	8 to 13 yrs.
O.	..	2	3	7	8	15	
Y.	..	1	3	4	13	14	
G.	1	12	3	9	6	4	
B.	11	7	14	1	2	..	
V.	20	7	5	3	..	..	

In summing up the general results, the negative responses or indifference to colors will first be mentioned. These, as

Table I. shows, were most frequent in the age group two to three years, at the time when blue preference begins to take the place of red. They would seem, therefore, actually to indicate a want of preference for particular colors at that age. We recognize, however, that one familiar with the way in which children respond to tests of this sort may feel justified in contending that the negative responses were due in part to the child's not understanding what was wished of it, to its inconstancy of attention, to fatigue, and the like.

The significance of the positive results is clear, however, and as they could in no way be vitiated by the negative results, we will not discuss further the actual meaning of the latter.

The first part of Table III. is particularly interesting. It shows that red is most likely to be chosen first by all infants under two years of age, and that yellow is a little more likely to be chosen second than orange, which is, on an average, third. Green, blue, and violet are the least attractive colors at this age.

In the age group two to three years the same general tendency is still recognizable, but blue has become more attractive.

The one child in the age group three to four years who was found to have red preference chose the colors at two separate trials in the following order: Y., R., O., B., G., V. The boy of six followed the exact order of the spectrum.

The figures in Table IV. show the intrinsic changes which the order of attractiveness in the cases of blue preference undergoes in passing from the early age groups to the later.

Blue and violet are everywhere more frequently chosen either first or second than any other color; but only in the last age groups, seven to thirteen years, does there seem to be a more decided preference for violet than for blue. The change of position of red is noteworthy. In the early age groups it is last, or near the last, but in the later age groups it gradually advances, until in the last two age groups it is most frequently chosen fourth.

Green, yellow, and orange, in the earlier age groups, are distributed about evenly among the last three places. In

the later age groups, however, yellow and orange tend to be chosen last of all.

CONCLUSION.

The order of development of perception and the order of attractiveness of colors in the young infant, in whom the process of selection is almost instinctive or physiological rather than the result of training or reflection, support by analogy singularly well the Gladstone theory of the development of color perception in the human race, so that this theory may have a certain value as a general evolutionary theory, although, of course, we must go down much lower in the mammalian scale than to primitive man to find the beginning of color perception.

To one who has interested himself in the matter of color perception the questions naturally present themselves: What are the functions of the various colors in nature? Why does the child react to colors differently at different ages?

We may perhaps go a little way toward tentatively answering these questions.

The colors of animal life must be left out of consideration here, since they have undergone innumerable changes for specific reasons, as Wallace and others have shown. But, in general, the predominating, or what we may call the background colors in nature are the blues and greens — the colors of the sky, the sea, the woods and the fields. The yellows and reds, complementary to the background colors, are found in smaller masses, and serve to call attention to particular objects, such as the blooming flower and the ripened fruit. These colors we may call the accent colors in nature.

The colors of the red end of the spectrum are generally conceded to be exciting or irritating when presented in large masses. Some of the lower animals are thrown into a frenzy at sight of them. The greens and blues, on the contrary, are known to be quieting and restful.

The young infant, it would seem, responds to the exciting colors in a physiological or almost instinctive way, choosing the colors of the red end of the spectrum before those of

the blue. As psychical development proceeds, and the child becomes more distinguished from the animal, and mental processes dominate the earlier more physiological reactions, we find first an indifference to all colors, and a little later, as a rule, a dislike for the exciting reds and yellows, and a preference for the less exciting colors of the blue end of the spectrum.

This is the typical change which occurs in the order of attractiveness as the child grows older, and this takes place probably without respect to environment or training.[1]

In a certain number of children the change from red to blue preference is not so direct, and after the period of greatest indifference to all colors, at the age of two or three, there is for a time a modified indifference, in which one or more of the middle and most luminous colors of the spectrum — orange, yellow, and green — is preferred, while indifference to the rest is maintained.

At the age of eight, blue or violet preference is almost universal, but red has begun to advance from the lower end of the scale. In adults, as others have found, the end colors of the spectrum—blue, violet, and red—are the attractive colors, while orange, yellow, and green, which in childhood are preferred for a time by a certain number of children, become the "disliked colors."

AN APPENDED NOTE ON MATCHING COLORS.

The ability to match colors correctly is a matter rather of discrimination than of perception of color and, as such, lies outside the scope of this paper; but since many of the attempts to study the color sense in children have been based upon this test, we may devote a few words to it here for the sake of completeness.

In brief, we found by many experiments that the untrained child, as early as the third or fourth year, except

[1] Matrons of infant asylums have informed us that a young infant will often be cross all day if dressed in a gray frock, but contented and happy if dressed in a bright red frock. Children from two to four years old are much less affected by the color of their dress. It is commonly observed in kindergartens that the younger children prefer the red playthings, while the older children prefer the blue.

when palpably color-blind, matches fairly saturated colors with great accuracy, blundering usually only in confounding blue and violet. But when worsteds of less saturated hue—tints and shades—were given to the child to be matched with the saturated test-worsteds, the results were very different. Many tints and shades were indeed placed with the saturated test-worsteds of the same hue, but not infrequently we found a disposition to match the worsteds according to luminosity rather than hue.

Thus pale tints of red, such as pink and salmon, frequently were matched with the more luminous colors—orange and yellow; and, on the other hand, dark shades of red and brown were frequently matched with the less luminous colors—blue and violet.

When the child is five or six years old, this disposition to match colors according to luminosity is lost, and the matching even of tints and shades is done usually with considerable accuracy, although there may still be a tendency to confound blue and violet, which is outgrown only later.

ON TUBERCULOSIS OF THE EYE.

By Dr. ERNST LUBOWSKI, Kattowitz.[1]

(*With two figures on Plate XIII. of Vol. XXXV. German Edition.*)

Abridged Translation by Dr. Ward A. Holden.

ABSOLUTE glaucoma following tuberculosis of the interior of the eye is an extremely rare condition, and although the literature of ocular tuberculosis is particularly rich, there is very little in regard to glaucoma in connection with tuberculosis, and I was able to find only three cases in which there was increased intraocular tension, hypotony being the rule. These cases, however, differ from mine in that the increased tension was not a prominent symptom and the glaucoma did not mask every sign of tuberculosis, as in my case. The case, therefore, seems worth reporting and the more so on account of the peculiar extension of the tuberculous process in the ball.

B. N., aged twenty-eight, a secretary, came to the clinic October 9, 1888, with the following history:

Early in June the right eye became greatly inflamed, with severe pain, diminution of vision, and the appearance of colored rings about a flame. Under the continued use of atropine the vision diminished until, at the end of August, even perception of light was lost. The pain then passed off for a time, but returned and became so severe that the patient came to our clinic.

St. pr.: L V = $\frac{6}{6}$; accommodation, visual field, and fundus normal.

Right eye: The ball is of normal form and size and the tension is increased to + 3. The cornea is surrounded by a rosy vascular zone 3 *mm* broad. The anterior chamber is shallow, vessels

[1] From Prof. Samelsohn's Clinic at Cologne.

are seen in the iris, the pupil is large and vertically oval. The reflex from the interior is of a smoky green hue, the vitreous is diffusely cloudy, and the fundus cannot be seen. On account of the intense pain the eye was enucleated October 10th. The course of healing was normal. The eye remained hard even after enucleation. It was fixed in Müller's fluid and hardened in alcohol. Its measurements were: Sagittal diameter 25 *mm*, transverse diameter 23 *mm*, and vertical diameter 24 *mm*. After being divided in a sagittal plane it presented the following macroscopic appearance (Fig. 1, Pl. XIII.): The cornea and sclera appear normal. The anterior chamber is shallow and in its lower part almost obliterated; the remaining cavity is filled with a cloudy, grayish, homogeneous mass. The iris in almost its entire lower half rests on the posterior surface of the cornea. The lens in its lower half correspondingly has a greater curvature than in its upper half. The retina and choroid lie in position on the sclera. The choroid apparently is not thickened; the retina, however, is greatly thickened in its inferior half and particularly about the disc. The thickened portion of the retina differs in color from the remainder and is covered with a layer of fibrin which appears behind the lens also. The vitreous is uniformly cloudy and of a grayish-green color. The optic disc is excavated but otherwise the nerve appears normal.

Microscopic. In sections from the middle of the eye the following conditions are found:

The cornea is slightly thickened from swelling of its fibrillæ and dilatation of its lymph-spaces. The epithelium is somewhat thickened near the sclero-corneal junction and beneath this thickened epithelium are new-formed blood-vessels and a small-celled infiltration. Infiltrations are also seen about the canal of Schlemm.

The membrane of Descemet is everywhere intact, but to some extent deprived of its endothelium. The anterior chamber is partly filled with a homogeneous coagulated mass free from cells and detritus.

The iris is infiltrated and thickened, and its vessels are dilated and their walls degenerated. There are many nodular infiltrations in the iris which at first glance suggest tubercles, without having their characteristic structure, but at the root of the iris typical tubercles are seen. The pupil is blocked by a fairly thick cellular membrane, which continues into the posterior chamber.

The ciliary body is congested and infiltrated, and in and among the ciliary processes are a number of typical tubercles.

The lens seems normal except for its change in form.

The choroid in its lower half exhibits a diffuse infiltration but no tubercles.

The most advanced changes found are in the retina, indicating this as the part primarily affected. In its anterior segment, it is completely degenerated and shows no trace of normal retinal elements, consisting only of a fibrous mass inclosing clumps of pigment. Posterior to this, the retina is transformed into a network of fibres with necrotic cells and detritus. From the equator backward, the retina is very greatly thickened, and consists of a dense hyperplastic connective tissue infiltrated diffusely with small cells and containing numerous tubercles of various sizes. Of the retinal structures, there only remain a few groups of small cells representing the nuclear layers, and diffusely scattered pigment. In the neighborhood of the disc the retina is thickened to six times its normal diameter, and exhibits a remarkable structure (Fig. 2). The outer layers are well preserved. Müller's fibres are pressed apart so that vacuoles are left—a sign of œdema. Farther inward there is a broad layer of vascular tissue in which lie quantities of typical tubercles, with numerous giant and epithelioid cells, surrounded by spindle-formed cells. Neither here nor elsewhere in the eye are there signs of retrograde metamorphosis in the tubercles. The individual tubercles are separated by tracts of darkly stained small cells. These conglomerations of tubercles make an interesting picture at the hilus of the central vessels, where they fill up a fairly deep excavation of the disc.

The upper portion of the retina is of normal thickness and of normal structure, except for accumulations of lymphoid cells here and there that are not typically tuberculous.

Staining for tubercle bacilli was successful, the bacilli being found in greatest number near the disc. Sections of the optic nerve stained by the Weigert-Pal method showed pronounced atrophy of the nerve fibres.

To sum up, the patient was a man of twenty-eight who had become completely blind in the right eye within three months as the result of a violent inflammation. The pain returning, the blind eye was enucleated later. What the na-

Fig. 1.

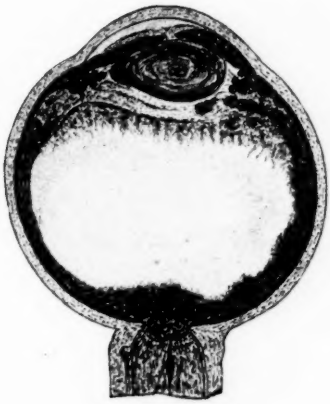
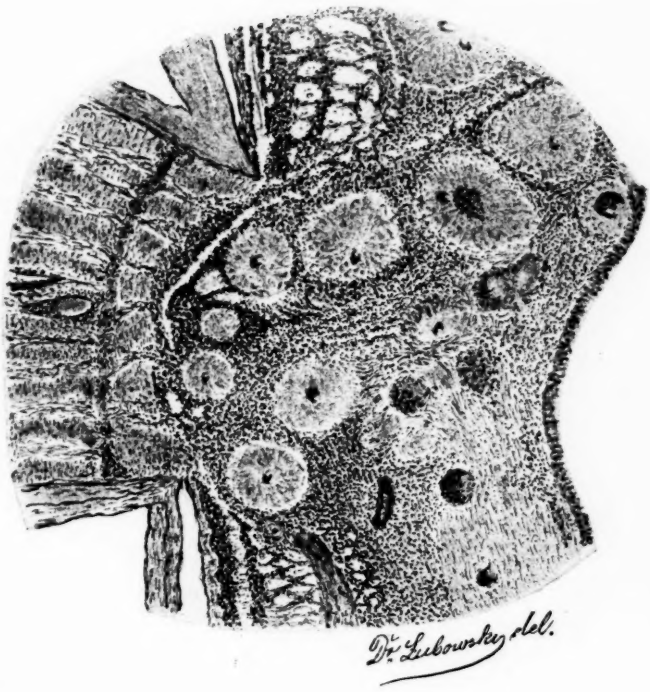


Fig. 2.



VERLAG VON J. F. BERGMANN IN WIESBADEN.

ture of the inflammation was cannot now be told with certainty. Although the patient's description would suggest glaucoma, the fact that atropine was prescribed would indicate iridocyclitis. When admitted to our clinic, the eye presented the picture of absolute glaucoma.

Increased tension in the course of tuberculous affections of the interior of the eye has been observed a few times in recent years.

Haab (*Graefe's Archiv*, xxv.) described a case of tuberculous tumor of the choroid, which appeared under the clinical picture of iritis serosa. The tension was normal at first, but as the tumor grew larger the tension became increased.

A second case was reported by Bongarty (" Ueber die Ausbreitung der tuberculösen Infection im Auge," *Inaug. Dissert.*, Würzburg, 1891). A patient of nineteen had gradually lost the sight of one eye a year before and now had an iridocyclitis in the other. Later a tuberculous nodule appeared at the ciliary margin of the iris in the second eye, the inflammatory symptoms increased, and the intraocular tension was frequently increased. Nothing is said as to the further course of the disease.

A third case was reported by Wagenmann (*Graefe's Archiv*, xxxiv., 4). The patient was a man of sixty-two, whose eye was blind from an injury received fifty-one years before. The eye, which had remained quiet all this time, suddenly became inflamed, and a chronic iridocyclitis developed, with increased tension. In spite of proper treatment, the symptoms increased in severity, the tension increased, the anterior chamber became shallow, and the iris pressed forward. An iridectomy was of temporary benefit, but in a few days the old condition became re-established, the coloboma was blocked with exudation, and the tension and pain increased so much that enucleation became necessary. The pathological examination revealed a tuberculous tumor of the choroid behind the ciliary body, projecting fungus-like into the vitreous.

Our case differs from the others in that the pathological changes induced by the tuberculosis brought about the clinical picture of absolute glaucoma, while in Bongarty's case,

in which the diagnosis was assured by the appearance of the tuberculous nodule in the iris, the increased tension was only incidental, and in the two other cases the clinical picture of intraocular tumor was dominant.

Increased tension in cases of tuberculous affection of the iris and ciliary body is, as the literature shows, of very rare occurrence.

From the arrangement of the tubercles in our case, it seems probable that the original affection was a tuberculous iritis or iridocyclitis, from which a secondary infection of the entire lower half of the retina took place. This is unusual, as extension from the ciliary body usually involves the choroid and not the retina.

My thanks are due to my former teacher and chief, Dr. Samelsohn, for putting this material at my disposal.

A CASE OF BILATERAL SO-CALLED COLOBOMA OF THE MACULA LUTEA.[1]

By Dr. KIMPEL.

(*With two drawings on Plates I.–II. of Vol. XXXVII. German Edition.*)

Translated by Dr. Ward A. Holden.

THERE has recently been reported a case of bilateral coloboma of the macula lutea by Dr. Katharina Kastalsky, of Moskow.[2] Through the kindness of Professor Hess I am able to report a similar case recently seen in our clinic.

H. M., aged twenty-three, came to the clinic complaining of extreme myopia.

His family is healthy, except for the fact that his father and his two elder brothers are also highly myopic and have a squint. His vision had been poor since his earliest childhood, and, according to his mother's account, he began to squint immediately after his birth. He had had great difficulty in school because of his poor vision. He had never worn glasses and had never had any inflammation of the eyes, and his vision, so far back as he could remember, had never been any better than at present.

The general examination showed the patient to be a strongly built man, without any malformations or anomalies of development.

Examination of the Eyes. — There is marked convergent strabismus. The patient cannot perform fixation with either eye. In attempting to look straight forward the left eye turns in until the nasal margin of the cornea reaches the inner commissure, and

[1] From the University eye clinic at Marburg.
[2] German Edition, December, 1897.

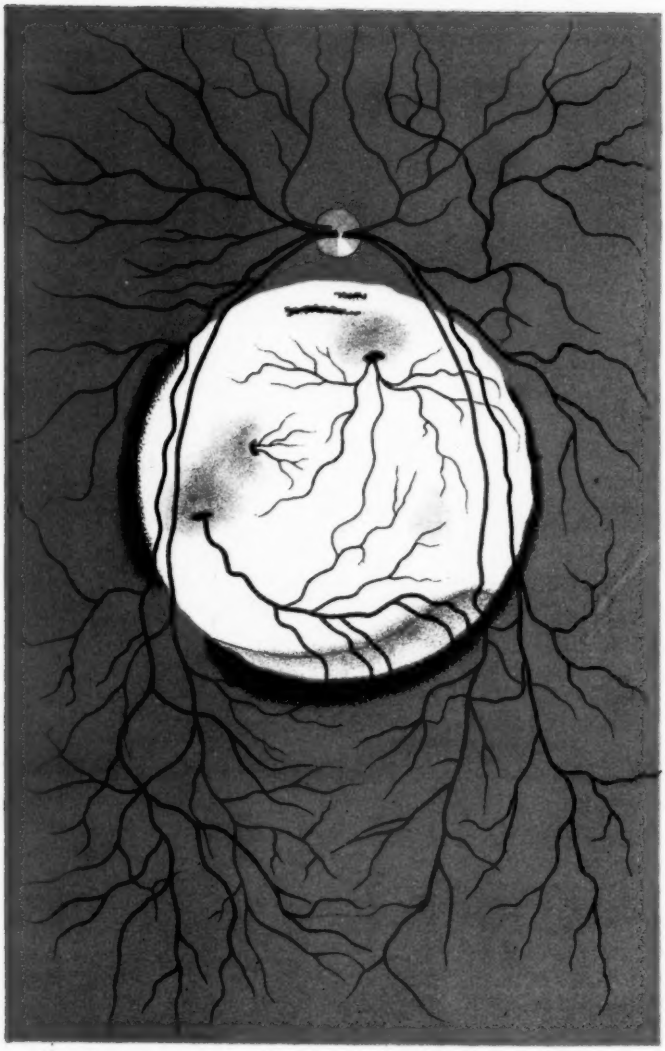
also turns slightly downward, while the right eye turns in, but not so much as the other. (Tenotomy of both internal recti, which was done later, diminished this convergence but slightly.)

When the right eye was covered, the left eye in its attempt to fix maintained its previous position, as did also the right eye when the left was covered. In both eyes at times there were nystagmus-like twitchings. If the object fixed is carried from the median line toward the left, the left eye, when the right is covered, follows until it looks directly forward. Beyond this it does not proceed, while the patient states that he still sees the object equally well when it is carried farther to the left, although the eye no longer follows it. If a further effort is made to follow the object, nystagmus-like twitchings appear, and the eye passes a little beyond the middle line and then turns back. The right eye acts in an analogous way. When the object to be fixed is carried downward, in uniocular vision the eye turns downward only when the object has been carried down to an angle of 45°. When the object is moved upward this is not the case.

Otherwise the eyes present no peculiarities. The balls are not especially prominent. The irides are developed normally. The refractive media are clear and transparent. Retinoscopy shows myopia of 15 D in the left eye and 14 D in the right. R, with $-$ 14, V = fingers at 1.5 *m*; L, with $-$ 15, V = $\frac{3}{30}$. With either eye Jaeger No. 3 was read at 6 *cm* without glasses.

Fundus of the left eye (Pl. I.): the nerve-head, otherwise of normal form and color, presents to its temporal side a sharply limited gleaming white sector and a narrow myopic crescent. The retinal vessels present no peculiar features.

About one-half disc-diameter temporally from the nerve-head begins a round patch, lustrous and yellowish-white, 10 disc-diameters across, occupying the region of the macula and its neighborhood. This area is sharply limited from the surrounding retina, which is of normal appearance. Above and below, the area is bordered by a narrow zone of punctate brownish-black pigmentation, which to the temporal side of the area becomes somewhat wider. Here the white area does not pass over abruptly into the normal retina, but there is a transition zone of a dirty reddish-gray color. The area otherwise is free from pigment, excepting two small stripes near the disk. One got the impression that in the entire area the sclera itself lay bare. However, there were many vessels present. The retinal arteries and veins arising in the disc pass obliquely



Linkes Auge.

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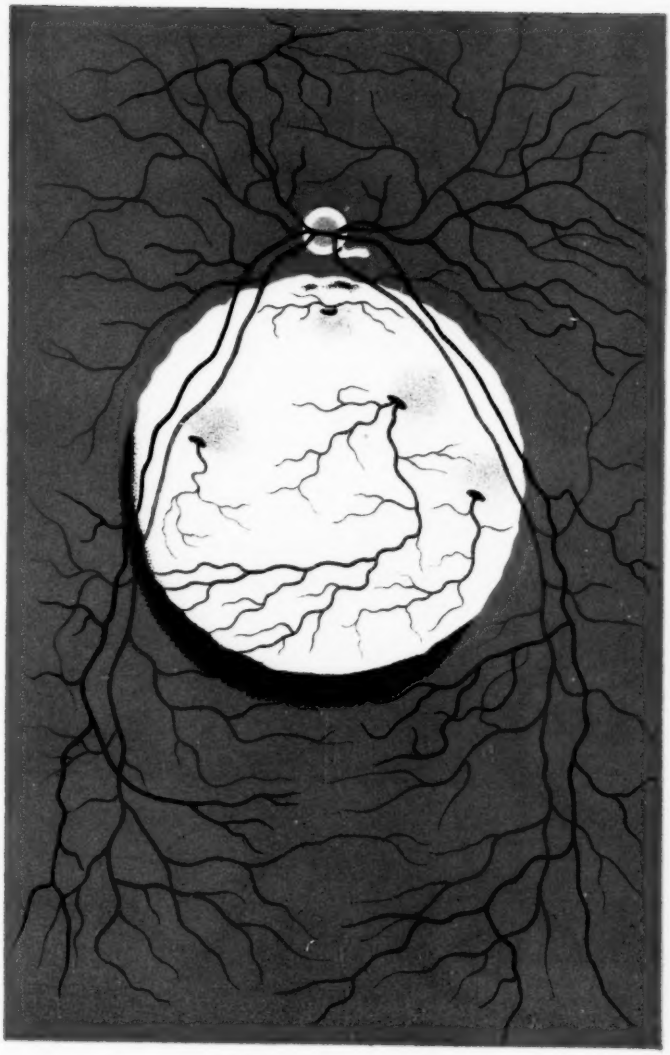


Rechtes Auge.

over the pale area, giving off small twigs. At the margin of the white area near the disc the vessels pass immediately and without arching into the area, but as they pass over the temporal margin they bend a little at the edge of the grayish crescent and again as they pass from this over to the normal retina. There are also numerous vessels which, entering the ball from behind, suddenly make their appearance on the inner surface of the sclera. They give one the impression of emerging from a shallow depression in the sclera, and they are apparently posterior ciliary arteries. The three main vessels give off many branches, some of which, passing over the gray crescent, disappear abruptly as they reach the red portion of the fundus.

Outside of this white area the retina shows no pathological changes.

The fundus of the right eye presents a symmetrical and similar white area agreeing with that in the left eye even to the smallest details. The disc differs somewhat from that in the left eye. Here there is a middle oval portion from which the vessels emerge. This portion is surrounded by a fairly pure white ring from which a tongue-like projection of the same color extends downward and outward. About one-half disc-diameter temporally begins a round, lustrous yellowish-white area of equal size and similar characteristics with that in the left eye. The crescentic transition area is wanting here, but there is a crescentic broadening of the pigment zone at the temporal margin of the white area, and a slight bending of the vessels can be made out where they pass over this zone. In the white area four ciliary vessels are visible.

A perimetric examination with a white test object 1 *cm* square showed the fields to be approximately normal. No scotoma could be made out. It should be noted, however, that the examination was very difficult since the patient was unable to fix accurately. For this reason no attempt was made to determine the color fields.

The conditions described seem to us to be specially interesting on account of their excessive degree and also on account of the clearness of the relations. Among all the

cases of "coloboma of the macula" that I have found in the literature, none has exhibited such extensive changes.

The case is certainly to be considered one of congenital anomaly—a pure developmental defect in a circumscribed portion of the uvea.

The pictures which we observe in cases of myopia of high degree and in cases of true inflammation are readily distinguished from the condition under consideration. Yet these two were the only affections to be considered in the matter of differential diagnosis. Our patient, it is true, suffered from high myopia which developed under a hereditary disposition. The conception of the white area as being due to atrophy of the coats of the eye, following myopic distension of the posterior segment, is opposed by the lack of pigment in the area. The narrow border of delicate pigment which partly surrounds the area cannot be regarded as having wandered from the entire atrophic area, and this view is opposed also by the nature, color, division, and arrangement of this pigment. In this case, moreover, there would be remains of choroidal tissue and especially choroidal vessels, but the few ciliary vessels that are present in no way present the characteristic arrangement and division of choroidal vessels.

The same reasons may be offered with great certainty in opposition to the view that this is an old choroiditic focus not related to the high myopia, with the further fact that similar foci are not found elsewhere in the fundus, and the fact that there is some bulging of the sclera in the temporal portion of the areas as evidenced by the curving of the vessels as they pass over it.

As was stated in the history, the patient was unable to turn his eye outward for more than a moment at a time, and therefore it was impossible to estimate by retinoscopy the difference in refraction between the normal retina and the ectatic area accurately in dioptries, although I assured myself that there was a considerable difference. Finally, against the idea of choroiditic foci may be urged the astonishing symmetry of the two areas, for no inflammation would have left results so similar in the two eyes.

Granting, then, that this anomaly is a congenital one, the question arises: To what intrauterine pathological processes did it owe its origin?

The old conception of Arlt, which was later adopted by Manz, Vossius, and others, that these so-called colobomas of the macula are due to an incomplete closure of the fœtal ocular cleft, has in recent years been shown on embryological grounds to be untenable, as Schmidt-Rimpler, Hess, and others have pointed out. We may refer especially to the paper by Chievitz (*Archiv f. Anat. u. Physiol.*, 1890), "Investigations on the Development of the Area and Fovea Centralis Retinæ."

There remain, therefore, only two possible explanations: first, an intrauterine inflammation, a sclero-choroido-retinitis (Deutschmann); and, second, a purely developmental defect such as Hess has assumed for cases of this sort. (*Graefe's Archiv*, xxxiv. and xxxvi., 1.)

Against the idea of an intrauterine inflammation are the almost complete absence of pigment in the middle of the area, and the color and disposition of the pigment, and finally the symmetry of the two foci. The fact that the remainder of the retina is intact would hardly accord with the idea of an inflammation, for an inflammation violent enough to have destroyed the entire macular region would have left traces in the neighboring portions of the retina.

By exclusion we come to regard the condition as one of pure developmental anomaly. In the second paper by Hess, cited above, he describes the eye of an otherwise healthy albino rabbit, which presented a round white area 3–4 disc-diameters across, occupying the region of the macula and representing a deep, regular ectasia of the ocular sheaths. When examined microscopically, the ectatic portion of the sclera was found to be 0.03–0.04 *mm* thick; the choroid was absent in this region and only a few vessels were found here and there on the inner surface of the sclera. All the layers of the retina were thinned here, but were normal elsewhere. There was no evidence of inflammation.

The condition in our patient was evidently very similar to that found in the rabbit, excepting that the ecstasia was

less marked in the former. The ophthalmoscopic changes in our patient could be explained satisfactorily by assuming histological changes similar to those found in the rabbit.

In conclusion I would express the hope that the designation, "coloboma of the macula lutea," which is unfitting since it suggests a relation to the fœtal cleft, will henceforth be given up.

RETROBULBAR NEURITIS, WITH PERMANENT CENTRAL SCOTOMA, FOLLOWING THE TREATMENT OF EXTENSIVE BURNS WITH IODOFORM.[1]

By L. D. BROSE, M.D., Ph.D.,

OCULIST AND AURIST, ST. MARY'S HOSPITAL, EVANSVILLE, IND.

(*With two V. F. Charts.*)

On November 19, 1897, I was asked by Dr. I. Wilton to see one of his patients who apparently within thirty-six hours had lost his eyesight. The **history** of the patient in brief is as follows: C. J., a married man, thirty-three years of age, and who had always enjoyed good health and eyesight, while following his occupation, that of steamboat cook, was injured, October 21st, on a gravel digger through an explosion of one of her boilers. The force of the explosion dazed him, and he was found with a piece of the boiler lying up against his back and badly scalded over the back of the body, arms, and legs. Beyond his burns he was not aware of other injury. He was conveyed to his home, where Dr. Wilton dressed his wounds with iodoform gauze. Because of free suppuration it was necessary to renew the gauze dressing daily at first. Recovery, however, rapidly set in, so that at the time of failure of sight perhaps three fifths of the burned area had cicatrized. His vision, which has been stated as always good, became very dim on November 17th, and within twenty-four hours he was unable to distinguish light from darkness. Associated with failure of sight was dull frontal headache, continuing for a week or ten days. The urine gave a specific gravity of 1.014, was acid, and contained neither sugar nor albumin. Tobacco and alcohol, to which he has for years been daily addicted,

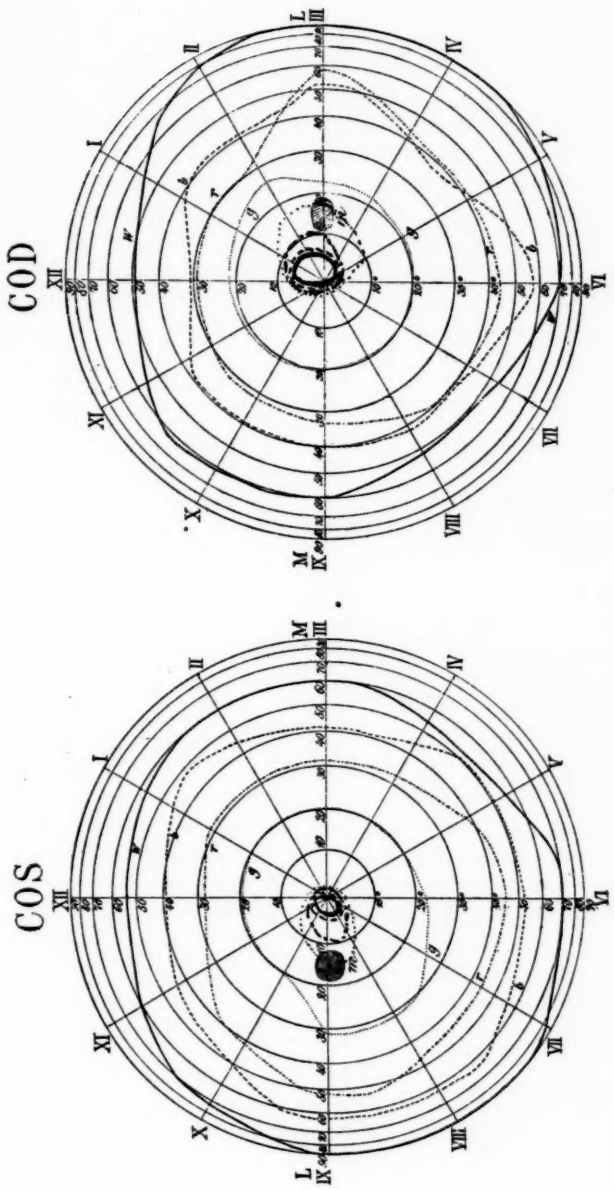
[1] Read before the Vanderburgh County Medical Society, February 20, 1900.

were proscribed by Dr. Wilton at his first visit. The general external appearance of the eyes was that of health, save for the pupils, which were dilated and irresponsive to light; and when the patient was placed before a window bright with daylight he still said he was in darkness. The tendon reflexes were normal, and all traces of syphilis were denied. With the ophthalmoscope the optic discs were found markedly swollen, with their margins blurred and everywhere very indistinctly defined. The veins of the fundus were full, but no hemorrhage or other lesion was found in any part of the retina or choroid. The iodoform gauze was directed to be discontinued, and the patient placed upon bichloride of mercury with tincture of gelsemium and belladonna.

On November 25th there was light perception with the left eye, but this was again lost by the following day and again recovered November 29th. On December 1st he was able with either eye to count fingers placed a couple of inches in front of him and directly in the line of vision. December 22d he could count fingers at four feet. The swelling of the optic discs disappeared slowly, and their outlines again became discernible with gradual improvement in sight, so that by June 5, 1898, vision was $\frac{15}{cc}$. However, in testing, the letters would come and go, and he was conscious of a central shadow. The peripheral field of vision so far as made out was free, and its boundaries normal. On January 11, 1900, the date of my last examination of the patient, his vision with + 4. spherical was $\frac{15}{c}$, and the temporal sides of the optic discs were pale. The field of vision still gave an absolute central scotoma for white, with enlarging defects for blue, red, and green. Beyond the central color-blind area the colors were again properly recognized. The treatment in addition to that already mentioned was hypodermic injections of strychnia in increasing doses, hypodermic injections of pilocarpine sufficient for free diaphoresis, and mercurial inunctions. The latter, however, after two attempts, had to be early discontinued on account of rapid ptyalism.

Among the first to recognize danger to sight from the continuous use of iodoform were J. Hirschberg,[1] of Berlin, who reports a case of amblyopia in a girl, occurring during the after-treatment of a hip-joint operation with iodoform,

[1] *Centralblatt für praktische Augenheilkunde*, Bd. vi., S. 922, 1882.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and upon the iodoform being discontinued the amblyopia disappeared; and Priestley Smith,[1] of London, who reports a case in a young man suffering from tuberculous pleurisy, where in forty-one days as much as one thousand grains of iodoform were administered. Amblyopia occurring, the drug was discontinued. Associated with the loss of sight were headache, giddiness, diarrhœa, and constant taste and smell of iodoform. On the third day after the iodoform had been stopped there was great drowsiness and slight left ptosis, disappearing in twenty-four hours. The vision in both eyes was greatly impaired, and with the ophthalmoscope the margins of the discs were found slightly hazy, but there was no pronounced papillitis. Both eyes disclosed a well-marked central scotoma, absolute for white at or near the fixation point. Vision steadily improved under injections of strychnia until at the expiration of three months it was $\frac{6}{8}$, when no scotoma could be found. De Schweinitz[2] says of iodoform, up to the present time but four cases have been reported. In these, central scotoma, which at times was absolute, was present, and ophthalmoscopic changes, when found, limited to slight changes in the outline and color of the disc. The prognosis, he states, is good. Valude[3] reports a case of burn of the right half of the body in a twelve-year-old child that was treated persistently with iodoform, where, in seven months, diarrhœa, headache, vomiting, and progressive blindness ensued. Upon discontinuing the iodoform all symptoms disappeared, and at the end of eighteen months there remained in both eyes white atrophy of the optic discs. In his opinion it is a question whether the amblyopia was due to the burn or the iodoform, since it has been found that neuro-retinal lesions at times follow extensive cutaneous burns. Terson[4] also reports a case of burn of the thigh and lower abdomen in a woman forty-eight years old treated with iodoform, where in three weeks and without appreciable general symptoms of intoxication, progressive amblyopia set in. Both nerve-heads showed

[1] *Ophthalmic Review*, April, 1893.
[2] *Toxic Amblyopias*, 1896.
[3] *Annales d'Oculistique*, 1893, vol. cix., p. 378.
[4] *Archives d'ophthalmologie*, October, 1897.

whitish atrophy, especially the temporal sides, with vision $\frac{1}{5}$. The condition did not yield to treatment. In his opinion, however, it is likewise a question whether the amblyopia was due to the burns or to the iodoform; but from the history of their cases, both Valude and Terson incline to the belief that the iodoform was the toxic agent. It is generally conceded that lesions of the optic nerve and retina at times follow extensive cutaneous burns, and how this may be brought about is readily comprehensible after reading Lustgarten's paper in the *New York Medical Record*,[1] wherein he shows that after such burns an animal poison is generated by micro-organisms developed in the eschar. He believes this poison to be either muscarine or something very similar to it. It is highly virulent even in small quantities, five milligrammes causing in man symptoms of severe nervous irritation. Atropia, he states, negatives the effect of the muscarine by paralyzing the susceptibility of the nervous system. In my patient the character of the scotoma and the absence of severe constitutional symptoms, with the gradual restoration of vision after the withdrawal of the iodoform treatment, strengthen my belief that the iodoform was the toxic agent. His high susceptibility to medicinal action, as instanced by rapid ptyalism after attempted treatment by mercurial inunctions, may likewise be used as supportive of this conclusion. I do not expect further restoration of sight, since the trouble is of more than two years' standing and the nerve-head shows in the temporal half whitish discoloration, indicative of atrophy of the macular-fibre bundle.

[1] *New York Medical Record*, August 8, 1891.

HEMIOPIA FOLLOWING POISONING BY ILLUMINATING GAS, WITH REPORT OF A CASE.

By HARRY FRIEDENWALD, M.D., Baltimore, Md.

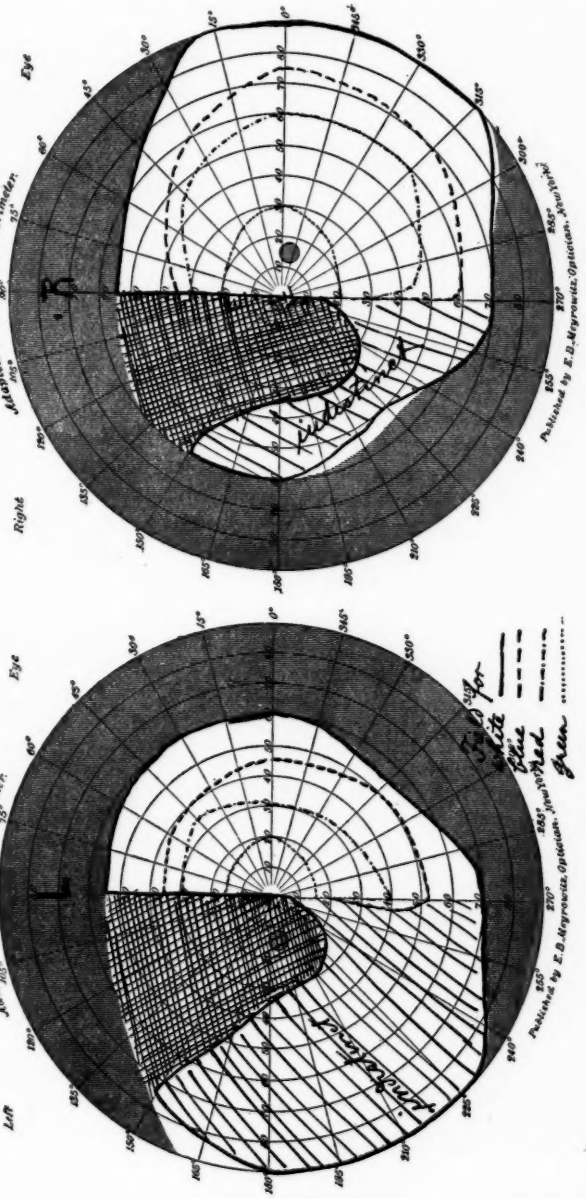
(*With a chart of the field of vision.*)

DURING recent years many interesting observations have been made, showing the different effects of various systemic poisons on the organs of vision. To these I shall add one which is interesting and unique.

Mr. H., aged about forty-five years, inhaled illuminating gas on the night of September 26, 1899, from about eleven o'clock until he was removed at about four and carried to a hospital in an unconscious condition. Consciousness returned during the forenoon of the same day. Five days later he was admitted to the Baltimore City Hospital on account of an affection of the great toe, which was, however, unconnected with the poisoning. While here he was referred to me on account of visual disturbance. He stated that he had been unable to read since the poisoning. Finding central vision and the fundus of both eyes normal, I attributed the complaint to presbyopia and was not a little surprised to find that convex glasses did not help him. He was therefore examined at the perimeter, and the cause of visual disturbance was found in the hemiopia shown in the accompanying chart of the field of vision. Though an intelligent man he was not conscious of this defect. The line of separation lies in the vertical meridian throughout the upper half of the field and for colors in the lower half likewise. The line of separation does not pass directly through the point of fixation but is removed about one half degree to the left.[1]

The motility of the eyes is perfect and there is no abnormality

[1] In order to test this point with accuracy I employed the Maddox scale which is used with his rod to measure deviations from muscular unbalance. The central spot is used as the point of fixation and the object used for testing may be one of the larger spots employed in perimetry, the distance four metres.


Eye
Right
Adapted to the Meyrowitz Perimeter.
Published by E.B. Meyrowitz, Optician, New York.
R.
Eye
Left
Adapted to the Meyrowitz Perimeter.
Published by E.B. Meyrowitz, Optician, New York.
L.
White
Blue
Red
Green

in the reaction of the pupils; Wernicke's hemiopic sign is absent; but the pupils differ slightly in size (R. 3 *mm*, L. 4 *mm*).

I wish to mention that he was able to read up to the time of the poisoning, that when he recovered consciousness his sight was somewhat disturbed, but that he was not blind. Furthermore, careful examination did not reveal any other symptoms of disease of the nervous system The patient remained under observation for several months; repeated examinations were made but no important change could be found in the field of vision as described above.

There is but one similar case in literature, that of Illing, published in the *Wien med. Zeit.* in 1874. The original is not accessible, but there is a review in *Nagel's Jahresbericht* (1874, p. 438), from which I take the following: An officer, poisoned by illuminating gas, recovered consciousness after violent vomiting. He was at first completely blind. On the following day vision returned; there was right-sided hemiopia. The defects were not perfectly symmetrical. Illing ascribes the affection to a lesion, probably a hemorrhage, near the chiasm, and he attributes this to the violent vomiting.

Quite a mass of literature exists on the subject of diseases following the intoxication of illuminating gas, and many pathological observations have been made, some of these experimental, showing the lesions produced. Jaksch in his large work, *Die Vergiftungen*, mentions polyneuritis, chorea, poliomyelitis, multiple sclerosis, Landry's paralysis, softening of the brain, and idiocy as sequelæ. He states that ecchymoses are found in all organs and extensive hemorrhages as well as spots of softening in the brain.

One of the fullest accounts of the nervous sequelæ is found in an article by Becker in the *Deut. med. Wochenschrift*, 1889 (pp. 513, 540, 562).

After careful study of these articles we may assume that the lesion in our case was a hemorrhage or spot of softening in the brain. We should locate this in the visual cortical centre, for the following reasons: the incompleteness of the hemiopic defect, the absence of Wernicke's hemiopic pupillary reaction, and the absence of a positive scotoma in the defective half of the field, the patient being entirely unconscious of this defect. While none of these points are entirely conclusive, together they appear to warrant this diagnosis.

THE OCCURRENCE OF RETRACTION MOVEMENTS OF THE EYEBALL TOGETHER WITH CONGENITAL DEFECTS IN THE EXTERNAL OCULAR MUSCLES.[1]

By JULIUS WOLFF, M.D., New York,

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(*With three figures on text-plate II. and three figures in the text.*)

THE congenital defects in the external ocular muscles have been the subject of much study and numerous communications on the part of European and American writers within the last decade. Through the writings of Kunn, in particular, their nature has become more clearly understood, and their distinctive features recognized. There is, however, one peculiar and interesting clinical picture coming under this head that has hitherto attracted only the most limited attention, for reasons that will appear below. I refer to the *retraction movements* of the eyeball, of which but very few cases are recorded.

Though this designation is a rather cumbrous one, it is the best I can find to express that pathological condition in which, by the contraction of one or more of the external ocular muscles, the eyeball is drawn backward into the orbit, and returns to its former position when this contraction ceases.

Since my attention was first called to this condition by a publication of Tuerk (1) early in 1899, I have observed five cases of this kind, while only seven have hitherto been reported.

[1] Read before the Section on Ophthalmology and Otology of the N. Y. Academy of Medicine, Feb. 19, 1900.

The histories of my cases are as follows:

CASE 1.—Sarah W., age nineteen years. The mother of the patient relates that she has always been weak and puny, and of a very nervous disposition. Apart from the ordinary diseases of childhood she suffered from no serious illness. Menstruation began at the age of thirteen, since which time she has been afflicted with peculiar attacks that seem to be of an hysterical nature. She suddenly falls to the ground, makes one tonic contraction of her limbs, and then slowly rises. There is no loss of consciousness, no convulsion, nor other symptom of epilepsy. At present there is no organic disease, excepting that the patient is feeble and anæmic. She complains of frequent pains on the right side of the head. An abnormality in her eyes was noticed by the mother in early childhood, and has undergone no change.

Examination of the eyes reveals the following condition:
V. O. D. $\frac{20}{100}$, sph. + 1.0 D ⊃ cyl. + 1.25 D a. 50° nas. $\frac{20}{40}$.
V. O. S. $\frac{20}{20}$, E.

The external parts of both eyes appear normal and show no signs of past or present inflammation. The pupils are round and react well to light. When the patient looks straight ahead the right eye diverges about 20°, and the right palpebral fissure is only 7 *mm* wide, being 2 *mm* narrower than the left (text-plate II, Fig. 1). Furthermore there is a constant enophthalmus of the right eye of 2 *mm*. The movements of the left eye are normal in all directions, as are also the up and down movements of the right eye. Every attempt, however, to turn the right eye inwards is entirely unsuccessful and is accompanied by a most striking phenomenon, inasmuch as the eyeball is drawn back with a quick pull into the orbit fully 8 *mm*. Thereby it is withdrawn from contact with the lids, whose free borders, through lack of support, approach each other, so that the fissure becomes only 3 *mm* wide (text-plate Fig. 2). If this test is made while both eyes are open, the retraction of the right globe is also accompanied by an upward rotation. As soon as the attempt at inward rotation is given up, the eyeball and lids return to their original position. When the patient tries to turn the right eye outward from the primary position just the reverse occurs. The globe moves forward 2 *mm* and the fissure widens the same amount, so that it equals the left one, but not the least outward rotation is effected (text-plate Fig. 3).

FIG. 1.

FIG. 2.

FIG. 3.

When an object of fixation is brought near to the patient to test convergence, the left eye follows it and turns inward, but the right one does not. Nor does it recede into the orbit as it would be expected to do if the internal rectus contracted, but, on the contrary, it moves forward. And vice versa, as the object is withdrawn and the patient looks into the distance, the right eye is retracted. This shows that there is no function of convergence present at all, and that the impulse which causes the left eye to fix upon near objects is not imparted to both internal recti, but is the same as that producing right lateral rotation.

After instilling cocaine into the right eye I tried with a pair of forceps to turn the same inwards, but was unable to do so to an appreciable extent. The globe seemed fixed on its outer side; I was, however, able to rotate it outwards.

Ordinarily the patient turns her head a little to the left. The axes of the eyes are then symmetrical and she has no diplopia. Stereoscopic and binocular single vision are present in this position. When the head is held straight there is still no diplopia, in spite of the divergence of the right eye, but with a Maddox rod before the latter crossed images can be produced.

Case 2.—Ernst W., five and a half years of age, is the youngest of six children and the only one to present an abnormality of the eye muscles. When he looks straight ahead, the visual axes are parallel. The movements of the left eye are normal in every respect, and the right eye can be moved up and down to the normal limits. It cannot, however, be abducted beyond the middle line. Adduction is possible, though very much restricted, and is regularly accompanied by a retraction of the globe into the orbit to the extent of 3 to 4 *mm* and a moderate rotation downwards. At the same time there is slight narrowing of the palpebral fissure. Each attempt to move the right eye outwards beyond the middle line is marked by slight forward movement of the globe. Both eyes can converge upon an object brought as near as 12 *cm* from the bridge of the nose, and the right eye is retracted during the act of convergence just as it is during left lateral rotation. The vision of both eyes is approximately normal, but on account of the child's unreliable statements, cannot, any more than the presence of diplopia or binocular vision, be tested accurately. Though nothing wrong about the child's eyes was noticed by the parents till the age of two years, the condition above described is, without any doubt, congenital.

Cases 3, 4, and 5 are members of one family, two sisters and a brother.[1]

The eldest of the three, Luise M., is a young lady of twenty. Vision of both eyes is normal. If left to herself she turns her head slightly to the right and the eyes are then symmetrically placed. If, however, the head is held straight the left eye diverges 15° to 20°, and there is crossed diplopia. All movements are executed perfectly with the right eye, and the left one moves normally upwards as well as downwards. It cannot, however, be rotated outwards more than 3 *mm* from the primary position, and this abduction is accompanied, as in the previous cases, by a forward movement of the globe and a slight widening of the palpebral fissure. Here also, inward rotation, which does not quite reach the normal limit, is accompanied by retraction of 3 *mm* and narrowing of the fissure by 2 *mm*. With the retraction a slight turning of the eye upwards takes place.

The fourth patient, Dora M., is a girl of fourteen and sister of the last one. Her head is usually turned to the right about 20°; when it is held straight there is slight divergence of the left eye with crossed diplopia. The left eye cannot be abducted beyond the middle line, and inward rotation, which reaches only 3 *mm*, is marked by a quick retraction of one half of a centimeter, a pronounced upward rotation, and narrowing of the fissure from 12 to 6 *mm*. On the right side the same condition exists, but in a much less developed degree.

The last patient, Felix M., is a nine-year-old brother of Cases 3 and 4. He holds his head straight, and the eyes, in the primary position, are parallel. They can converge to a point 8 *cm* from the bridge of the nose. Vision is normal. The right eye shows normal motility. The left one can be abducted with difficulty about 4 *mm*. Adduction is only slightly restricted and is accompanied by a moderate retraction, but no perceptible narrowing of the fissure. The forward movement of the eyeball, as the eye recovers from the adducted position, is more readily noticed than the retraction during adduction. This is the least pronounced case of all. Binocular single vision is present in all

[1] These cases are the same as those described by Carl Kunn, of Vienna, in a monograph on congenital defects of ocular movements (*Beitr. z. Augenheilk.*, Heft xix., pp. 59–65). Kunn seems to have overlooked the retraction of the eyeball, as he does not mention it. In every other respect his descriptions of these cases are most accurate and apply exactly to the present condition. I shall, therefore, describe only those features which have a direct bearing upon the subject of this paper, and refer to Kunn's description for other details.

parts of the field in which the axes of both eyes can be made to cross at the object of fixation; otherwise there is diplopia.

When I compared the above cases and the cases of retraction movements previously reported, of which there are only seven, I found that with the exception of the one published by Heuck (2) in 1879, they all presented a most striking similarity in their general features. Of the six other cases one was published by Stilling (3), three by Tuerk (1, 4), one by MacLehose (5), who states that he has seen others just like it, and one by Bahr (6).

The first point that all these cases (including my own) have in common, is the association of the retraction movements with a congenital defect in the motility of the retracted eye. Heuck's case, which differs somewhat from the rest, presented bilateral ptosis and almost complete immobility of the right eye. Every attempt to move the eye resulted merely in a slight retraction of the globe into the orbit. In all of the other cases, however, only the external rectus of the retracted eye showed a more or less complete impairment of its function. [I have, hitherto, purposely refrained from calling this congenital muscular defect a paralysis, for, strictly speaking, it is not such. Silex has shown the pathological condition underlying it to be a lack of development, an aplasia, and not, as in acquired paralysis, an atrophy or degeneration. When, therefore, I shall hereafter apply the name paralysis to these congenital defects, I shall do so for the sake of conciseness, and with this limitation in mind.]

The second point of resemblance between all of these cases, that of Heuck being for the present disregarded, is that the retraction invariably takes place during attempted inward rotation—that is, when the antagonist of the paralyzed muscle is innervated. The inward rotation itself is in some cases entirely absent, in others only impaired, thereby simulating to a greater or less degree a paralysis of the internal rectus muscle. The explanation hereof will appear later.

The next common symptom, namely, the narrowing of the palpebral fissure during adduction, is directly due to the

retraction of the globe, and is the more pronounced the greater the retraction. It is not to be construed, as has erroneously been done, as an active contraction of the orbicularis, but is due to the loss of the support given to the lids by the eyeball, just as in cases of enophthalmus and shrunken globe.

There is a further symptom which has not been described in any of the previously reported cases, probably because of having been overlooked, but which is present in four of my five cases. I refer to the forward movement of the globe, accompanied by widening of the palpebral fissure during attempts to turn the eye outward from the primary position of looking straight ahead. This symptom is just the converse of the preceding one.

Several of the cases, especially those in which the affected eye diverged while the head was held straight, presented a condition of permanent enophthalmus and narrowing of the fissure, not only during adduction, but also while the gaze was directed forward.

Finally, in nearly all of the cases in which the retraction was considerable, the latter was accompanied by an upward or downward deviation of the eyeball, even when pure adduction was attempted.

As the symptom of retraction by muscular action has not been described in any other than the above twelve cases, it will be seen that it never occurs alone, but is always combined with certain other symptoms, forming a well-defined clinical picture, which presents differences in degree of development only, and not differences in kind. Heuck's case is only in so far different from all the others in that not only the external rectus, but all of the muscles, except the retracting one, were paralyzed.

The chief interest connected with this clinical picture lies in its explanation. Tuerk, of Berlin, who published two of the cases in 1896 (4), and another early in 1899 (1), suggested what seems to me undoubtedly to be the correct interpretation. He mentioned two possible ways in which retraction of the eyeball might be produced, which I shall briefly designate as the *faulty-insertion* and the *fixation* theories.

According to the *faulty-insertion theory* the retracting muscle, which is the internal rectus, is attached to the eyeball farther back than normal. Consequently, the portion of muscle capable of unwinding itself from the globe is diminished, and inward rotation is correspondingly replaced by a backward pull on the globe when the internal rectus contracts. This theory finds support in the cases of Heuck and Bahr. The former incised the conjunctiva and found the insertions of the external and superior recti situated considerably farther back than normal. The other muscles were not inspected. Bahr operated upon his case to cure the convergent strabismus of the retracted eye. He found no trace of the presence of an external rectus, while the internal rectus consisted of two portions, the one inserted 12 millimetres from the cornea and the other still farther back. But even if, in these two cases, a faulty insertion of the internal rectus could have caused the retraction, the theory does not take into account the paralysis of the antagonist which is present in all the cases and ought, therefore, to be considered as a factor in explaining the mechanism of retraction.

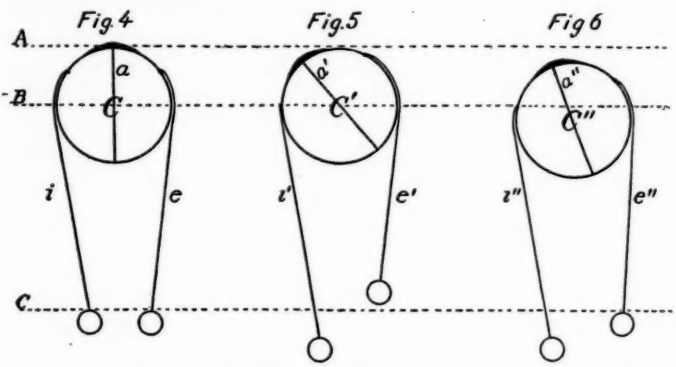
The *fixation theory* seems to me to be more in accord with the clinical manifestations of most of the cases of retraction movements. In advancing this theory, Tuerk assumes that the paralyzed external rectus consists of an unyielding connective-tissue strand in place of elastic muscle fibres. It, therefore, fixes the eyeball on its outer side and offers an obstacle to adduction, so that the eye can yield to the traction of the internal rectus only by moving back into the orbit at the same time that it turns inward. This action is well illustrated by a model which has been constructed for me very ingeniously by Dr. Sidney Yankauer, and which is represented by Figs. 4, 5, and 6.

Since the muscles in question are direct antagonists and lie in the same plane, the eyeball is represented in the model by a circular piece of card-board which can revolve about the centre of rotation (c, c′, c″). The internal and external recti muscles are represented by silk threads (i, i′, i″ and e, e′, e″), at the proximal ends of which small rings are

attached, allowing traction to be easily made. The base-line C is at the points of insertion of the muscles at the optic foramen, and the shortening and lengthening of the elastic muscles, during contraction and relaxation respectively, is indicated by the distance that the ring moves behind or in front of the base-line C.

Fig. 4 represents the normal eye in the primary position.

Fig. 5 represents normal adduction of 45°. The centre of rotation, c′, remains stationary, and just as the internal rectus, i′, is unwound from the globe, the external rectus, e′, is rolled up around it.



If, however, the external rectus, e, is inelastic and unyielding, as the fixation theory assumes it to be, and as it is made to be in the model by fastening its ring at the base-line C, then it is clear that contraction of the internal rectus, i, not only results in adduction, but also displaces the eyeball backwards in toto, as represented by Fig. 6. Though the amount of contraction of the internal rectus be the same in the conditions represented by Figs. 5 and 6, the resulting adduction is much less in the latter case than in the former. This would explain why, in all the cases of retraction, adduction is incomplete, even though the internal rectus be normal in its insertion and power.

There is abundant evidence that this fixation theory is correct. In the first place it has the attribute of plausibility, because it accounts in an unstrained manner for all the

symptoms, the defective abduction, as well as the diminished adduction and the retraction. The more inelastic the external rectus is, the more pronounced will be the other symptoms. Furthermore, Tuerk has found, experimentally, that when the eyeball is firmly fixed on one side with a pair of forceps and the opposite muscle is strongly contracted, a retraction of the eyeball invariably results. The inelasticity of the paralyzed external rectus has been proved in several cases, including my first one, by the fact that even strong traction with the forceps could not produce pure adduction. Nor is the direct evidence of inspection wanting. Stilling operated upon his case in order to cure the divergent strabismus that was present. He advanced the internal rectus, which was not found to have a faulty insertion. The result was that the retraction became even more pronounced than before. I also operated upon my third case in order, if possible, to cure the retraction, for a reason I will mention later. I found both the external and internal recti normally inserted, and divided the former in the hope that it would reattach itself farther back. The immediate result of the operation was that the slight abduction, which had been present, was lost, adduction increased, and the retraction no longer to be seen. After the muscle had reattached itself, however, the condition was just the same as before. Since in these two cases a normally inserted internal rectus caused retraction of the globe, there must have been some fixation on the outer side by the external rectus.

The constant enophthalmus which has been observed in several of the cases even when the patient looks straight forward, is also readily explained by the same mechanism. We need only bear in mind that, normally, in the primary position of the eyes, the internal recti (as well as all the other muscles) are in a state of slight contraction, and are only relaxed completely when their antagonists contract — that is, during outward rotation. This tonus of the internal rectus suffices, when the unyielding external rectus is rather short, to hold the eye in a retracted position, and then we get the condition presented in Fig. 1. The complete relaxation of the internal rectus also explains the propulsion of the globe

during attempted abduction from the primary position, to which I have drawn attention above.

One further peculiarity of these retraction cases remains to be explained. Whenever, in the more pronounced cases, the normal eye was abducted, the affected eye not only turned more or less inwards and receded into the orbit, but also made either an upward or a downward movement. I would explain this phenomenon as follows: As the eyeball recedes into the orbit it displaces the orbital contents, but the optic nerve, having a firm consistency, offers a certain amount of resistance to the backward movement of the eyeball at its point of attachment. Unless this resistance is made just in the plane of the retraction, the effect must be to rotate the cornea either upwards or downwards; upwards, if the point of resistance lies below the plane of retraction, downwards if it lies above. Which of the two conditions is present in any individual case will depend upon its anatomical peculiarities.

Thus far these cases of retraction of the eyeball might seem to be objects of scientific interest only, but in reality they sometimes also present questions of practical importance. For example, my first and third cases have always complained of headaches on the same side as the affected eye. That these headaches are due to the oft-repeated retraction of the globe and consequent pressure on the orbital contents, I feel quite certain. If any one will repeatedly push back his eye into the orbit for a half or three-quarters of a centimetre, he will experience an unpleasant sensation of pain. Indeed, these two patients always complained of increased headaches whenever their ocular movements were tested at length. I, therefore, advised both of them to submit to an operation in the hope that the retraction of the globe might be cured. The first patient did not consent, the other has had an operation performed. As I mentioned above, I divided the external rectus and, for the time being, both the retraction and the headaches were relieved. But both returned, because the muscle, not possessing much contractility, undoubtedly reattached itself at its old point of insertion. If I had kept the eye fixed in an adducted posi-

tion during the process of healing and thus succeeded in setting back the external rectus — that is, practically lengthening it, I believe the retraction and probably also the divergence would have been cured. A glance at Figs. 5 and 6 will show, provided the fixation theory is correct, that this is the only rational proceeding in those cases which present divergence in the primary position. Advancement of the internal rectus would only aggravate the condition, as shown by Stilling's case. Some of the cases, however, present convergence of the retracted eye in the primary position. The proper proceeding, provided an operation is indicated at all, would then be a tenotomy of the retracting internal rectus with fixation of the globe in an abducted position to ensure an effect. It seems to me that in this way the convergence and retraction would be improved, though some motility would be sacrificed.

In concluding I should like to express the opinion that these cases of retraction movements are not so very rare as it would seem, and that they are undoubtedly frequently overlooked. The cause for this may well lie in the fact that the narrowing of the palpebral fissure hides the backward movement of the globe. Clear examples of such an oversight are given by the two sisters and one brother, my third, fourth and fifth cases. As was mentioned above, Carl Kunn (7), Vienna, who certainly is a most careful observer, failed to see the retraction, though he published these same cases as examples of congenital paralysis. Farther along in the same article Kunn (8) relates another case which resembles in every way the typical picture I have described, except that the retraction is not mentioned; and here, too, I am inclined to believe that it was overlooked. The same may be said of a case of Alfred Graefe (9), described in his *Handbook*, in which there was complete congenital paralysis of the left external rectus and a striking narrowing of the fissure during adduction of that eye.

It is fair to assume, then, that many of these cases have been overlooked, and that when attention is generally drawn to them, they will be found to be of more frequent occurrence than the few cases hitherto reported would indicate.

SUMMARY.

Retraction movements in the human eye have been described in only seven cases, to which five are herewith added.

The retraction movements never occur as a solitary symptom, but always form part of the same group of clinical symptoms, producing a well defined clinical picture, whose characteristics are as follows:

The condition is always congenital.

Retraction occurs during attempted adduction, which may be absent or present, but is always less than normal.

Retraction is accompanied by narrowing of the palpebral fissure.

Partial or complete paralysis of the external rectus of the retracted eye is regularly present.

Some cases present a moderate constant retraction and narrowing of the fissure even in the primary position. In these cases attempts at abduction produce a propulsion of the globe and widening of the fissure.

When the retraction is considerable, the cornea is turned upwards in some cases, downwards in others, even when the fellow eye makes a purely lateral movement. This is due, probably, to resistance made by the optic nerve.

Two explanations are offered to account for the retraction: the *faulty-insertion* and the *fixation theories*. Though the former is supported by some evidence, the latter accounts more satisfactorily for all the symptoms and is even better supported by evidence.

Surgical interference may benefit some of the cases.

There is reason to believe that the retraction movements are often overlooked and that these cases are not so rare as the small number reported would indicate.

LITERATURE.

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REPORT OF A CASE OF RETRACTION OF THE EYEBALL.

By Dr. A. N. ALLING, New Haven, Conn.

(*With two figures on text-plate III.*)

MY attention was first called by Dr. Wolff to the class of cases which forms the subject of the preceding article. On June 21, 1899, the following case came under my observation:

Ruth H., seven years. Only child. Healthy. No instruments used at delivery. Left eye does not turn outward beyond the median line. It turns inward only 25° and at the same time *is drawn directly backward* into the orbit about 10 *mm.* The palpebral fissure simultaneously narrows to about one half its width in the other eye. (vd. plate). Motility upward and downward is normal. The child habitually carries the head to the left side. Vision, with correction for slight astigmatism, normal in both eyes. Motility of right eye is perfect.

Thinking to do away with the disfiguring retraction of the eyeball, a tenotomy of the left internal rectus was made. The tendon was found to be very broad and thick, but its insertion was normal. An exploratory incision over the external rectus revealed nothing but tendinous tissue, giving the impression of conditions in the cadaver. There was a sense of resistance on forcible rotation toward the caruncle. This, however, could be accomplished.

There was diplopia for a few days after the operation. The final result (eight months) shows motility much diminished inwards and a slight amount of retraction. The eye can be turned outward a very little beyond the median line and the head is no longer held to one side. There is no divergence. In spite of the decreased motility the cosmetic result is satisfactory.

Eyes right.

Eyes left.

RETRACTION MOVEMENTS IN A CASE OF CONGENITAL CONTRACTION OF THE INTERNAL AND PARALYSIS OF THE EXTERNAL RECTUS OF THE LEFT EYE.

By HERMAN KNAPP, New York.

THE preceding paper of Dr. Julius Wolff, and the communication of another case by Dr. A. N. Alling, of New Haven, Ct., determines me to add the subjoined case from my practice to the scanty records of this rare muscular anomaly described with so much detail and suggestiveness by Dr. Wolff.

Jan. 18, 1896, Mr. Elk. Deiches, then of Johnsonburg, Pa., brought to me his five-year-old daughter, Edith. Her left eye showed a congenital convergence of about 3‴, S = $\frac{8}{200}$, interior normal. With the ophthalmoscope, under homatropia, I found that her right eye had H 3. D, the left eye H 6. D. After birth the left eye was stiff, but gradually acquired a certain degree of mobility. It was deep-seated. I prescribed for both eyes +3.D which she has worn since.

Those are the notes in my case-book.

She was not seen until March 31, 1900, living now in 57 E. 117th St. of New York City. The girl was somewhat frail, but healthy and intelligent. The left eye was in adduction of 20°, and somewhat sunken in. By voluntary movements to the right side the adduction was increased by about the same degree, while the eye at the same time was conspicuously drawn back and somewhat down. The palpebral fissure was narrowed and the eyeball receded so as to lose touch with the lids. In the most forcible abduction the globe was directed straight forward, with greatest effort slightly beyond the median plane. In these movements the eyeball not

only resumed the normal position, but even showed a slight protrusion. In ordinary look it was slightly retracted and about 4 *mm* deflected toward the nose. With +1.25 S R is $\frac{20}{20}$, L $\frac{20}{40}$. No diplopia.

May 7, 1900, I made a tenotomy of the left internal rectus. The tendon was very thick and its insertion line reached downward almost to the insertion of the inferior rectus. As the effect after the severing of the insertion of the tendon was insufficient, I divided subconjunctivally, on the hook, some bands which seemed to be posterior insertions. Immediately the eyeball protruded and diverged markedly, moving neither in- nor outward, while the vertical movements were preserved, but restricted. I stitched the tendon forward with three firm sutures, the effect of which was reduction of the protrusion of the globe. The latter retained a slight divergence, and both adduction and abduction were completely suspended, whereas the vertical movements were fair. I did not care further to change the position of the eyeball, *i. e.*, produce a small degree of convergence, as the conditions I had to deal with were novel. I thought I would wait and do a correction of the position, if needed, later. To-day, May 25, 1900, the child came again ; positions and mobility are greatly improved. The eyeball does not protrude any more, and there is so small a divergence that the cosmetic effect is, to all parties, quite satisfactory. Abduction is almost nil, adduction restored to a certain degree, with the accompanying retraction. The patient sees double sometimes ; she evidently has now binocular vision, as she turns her head slightly to the left and holds her eyes parallel.

This is certainly a case of the same kind as those of Wolff and others. I abstain from attempts at an explanation of the singular phenomenon, which made on me the impression of the voluntary retraction of the eyes in certain animals, for instance the horse. The operation also demonstrated something like a retractor muscle.

A CASE OF A GLAUCOMATOUS ATTACK FOLLOWING INSTILLATION OF EUPHTHALMIN.

By HERMAN KNAPP.

IN my "Note on the Use of Euphthalmin" in the May number of the ARCHIVES OF OPHTHALMOLOGY vol. xxvii., p. 313, 1899, I said (p. 314): "In two cases I received the impression that euphthalmin, like atropin, had a tendency to increase the eyeball tension. In many later cases I have not seen this effect any more." In the subjoined case, two drops of a 7½ per cent. solution of Schering and Glatz's hydrochlorate of euphthalmin brought about such a pronounced and immediate onset of an acute attack of glaucoma as I have ever seen after the instillation of any other mydriatic. The case is as follows:

Mrs. A. P. Leach, of 123 W. 80th Street, New York City, aged sixty-two, consulted me April 22, 1900. Her left eye was blind from absolute glaucoma; in the right S = $\frac{20}{40}$ with + 1^c ax. horiz. $\frac{20}{20}$; pupil, field of vision, and tension normal. Noticed diminution of sight recently in R and pain in L eye. Several times she has seen green and blue rings around lights, with dimness of sight and ciliary neuralgia. When she presented herself, I found the anterior chamber of the right eye shallow, especially above. To examine the background, I dropped two minims of a 7.5 per cent. solution of euphthalmin into each eye. In ten minutes I noticed +T½ in the right, and +T_1 in the left (blind) eye. During the next fifteen minutes, the tension increased in both eyes; in the right it was +T_1 fully, cornea steamy, eye painful, sight markedly dim, pupil dilated ad maximum, optic disc distinctly but not completely cupped, and marked haloes were seen around the light, —in short, there was a pronounced outbreak of acute glaucoma. I instilled two drops of a 2 per cent. solution of pilocarpin, and in half an hour two drops more. Half an hour later, the pupil was

medium wide, but the cornea still hazy, S dim, haloes persistent, and still $+T_1$. I told the patient the attack was produced by the first eye-water, which was generally believed harmless, and as the other drops had relieved but not cured the attack, I would instil a stronger antidote. She was not at all frightened, I dropped two drops of a 1 per cent. solution of sulphate of eserin in both eyes, which in from fifteen to thirty minutes had, in the right eye, reduced the tension to the normal, restored sight, dispelled the colored rings, contracted the pupil to about 1 *mm* in diameter, — in short, had caused the glaucomatous attack to disappear completely. The left (blind) eye was also relieved. A few days later I performed a glaucoma iridectomy on the right eye which healed smoothly. Sight, tension, etc., have since been normal.

Though I anticipated such cases from the beginning of my acquaintance with euphthalmin, I have used the remedy daily, and the remarkable freedom from a hypertonic action of the drug emboldened me to use it indiscriminately also in examining glaucomatous eyes. Here and there it was followed by a doubtful increase of tension, which always disappeared, even without a miotic, except in the above case, where the milder miotic, pilocarpin, was not sufficient to cut the attack short. Euphthalmin is such a useful auxiliary in ophthalmoscopy that I shall not hesitate to use it everywhere as heretofore, for it produces glaucomatous attacks only exceptionally, attacks which, it seems, can readily be cured with eserin.

Euphthalmin has hitherto enjoyed an excellent reputation of being free from the unpleasant secondary effects of the other mydriatics. The above case demonstrates that it may, like all the rest, produce glaucoma. Is it not permissible to suppose that euphthalmin, having only a weak and transient action on accommodation, is likely to possess, only in a less degree all the other favorable and unfavorable properties of atropin, the chief representative of the mydriatic group? Formerly we were taught to substitute extract of belladonna (℥ i ad ℥ i) for atropin when the latter produced erythema, conjunctival irritation as in trachoma, and the like. The question is: Are all the mydriatics poisonous proportionately to their strength, or are there any that are free from secondary effects inherent in the stronger ones?

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE FOURTH QUARTER OF THE YEAR 1899.

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WITH THE ASSISTANCE OF

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Translated by Dr. Ward A. Holden.

Sections I.–III. Reviewed by Prof. HORSTMANN.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

517. Andreæ, Julius. The injuries of the eye from lime and similar substances. Leipsic, 1899, Engelmann.

518. Schulek. *Hungarian Contributions to Ophthalmology*, vol. ii. Leipsic and Vienna, 1900, Deutike.

519. Widmark. *Reports from the Eye Clinic of the Caroline Medico-Chirurgical Institute at Stockholm*, vol. ii. Jena, 1899.

520. Salzmann. A section of the human eye. Charts for ophthalmic instruction. Edited by Magnus, xviii. Breslau, 1899, Kern.

521. Fick. Hygiene of the eye. *Graefe-Saemisch Handbook*, parts 12, 13, and 14. Leipsic, 1899, Engelmann.

522. Fick. Blindness. *Ibid.*, part 14.

523. NUSSBAUM. Development of the human eye. *Ibid.*, 14 and 15.

524. BERNHEIMER. The region of the nuclei of the ocular nerves. *Ibid.*, 15.

525. SCHUBERT. On vertical and oblique handwriting. *Festschrift z. 24. Versammlung d. deutschen Vereins f. öffentl. Gesundheitspflege in Nürnberg 1899.*

526. MELLINGER. The Basle Eye Institute. *Thirty-fifth Annual Report.* Basle, 1899.

527. MACHEK. *Report of the Ophthalmic Division of the Hospital at Lemberg, Galicia, for 1892–1898.* Lemberg, 1899.

ANDREÆ (517) is under the impression that the views generally held as to the nature and results of lime injuries are erroneous. The injury depends upon the chemical or physical action of the lime on the tissues of the eye. Only the insoluble calcium combinations are non-injurious. All the other salts have an identical action, consisting in a destruction and loosening of the tissues, in the deposition of a white mass in the cornea and conjunctiva, and in a secondary inflammation, with, finally, the formation of a scar. In fresh cases of injury, long-continued washing out of the eye with pure water is the best method of treatment. Acids should not be employed.

SCHULEK'S (518) work contains papers by himself on glaucoma, instruments for cataract extraction, and protecting glasses; by Imre, on cataract operations and argentamin; by Csapodi, on examinations of large numbers of persons and on adaptation of the retina; by Issekutz, on retrobulbar echinococcus; by Grosz, on the eye symptoms of tabes; by Blascovics, on tumors of the cornea, and prolapse of the contents of the ball after intraocular hemorrhage; by Scholtz, on leucæmic retinitis, anterior sphincterolysis, and new formation of membranes in retina and vitreous; by Waldmann, on glaucoma, and the operation for luxated cataract; by Leitner, on hereditary optic-nerve atrophy and retrobulbar neuritis; by Mark, on atropine conjunctivitis; by Abel, on the presence of bacilli in cases of mental disease; by Hauer, on atropine conjunctivitis; and by Schwitzer, on the etiology of senile cataract.

WIDMARK'S (519) reports contain papers by Dalén, on holocain; by Helleborg, on tumor of the iris; and by Widmark, on blindness in Scandinavian countries and in Finland.

Widmark's statistical investigations rest partly upon official statistics and partly on the examination of patients in hospital and private practice. The following are the facts of particular interest: The percentage of blind persons to ten thousand inhabitants is in Denmark 5.3, in Sweden 8.3, in Norway 12.8, and in Finland 15.5; trachoma being more frequent in Finland, and 30 per cent. of the blindness in that country having been produced by trachoma. Trachoma has long been recognized in the northern countries, and in the literature of the eighteenth century was reported as being endemic in certain regions.

In Norway the high percentage of blindness is chiefly due to diseases of old age; 50 per cent. of all cases are attributed to cataract, the extensive and sparsely populated land rendering operative treatment difficult.

In Sweden traumatic causes play an important rôle, direct injuries furnishing 9 per cent. and sympathetic ophthalmia 10 per cent.

In general, ophthalmia neonatorum is responsible for between 20 and 30 per cent.

Blindness in these lands has decreased very greatly in the last decades. DALÉN.

SALZMANN (520) has prepared two charts of sections of the human eye. The first represents a horizontal section through the eye; the second the angle of the iris and neighboring parts.

MELLINGER (526) treated 2883 patients and performed 225 operations, 79 of which were for cataract. He reports further a number of rare cases.

MACHEK (527) reports on the work done in the eye department of the Lemberg (Galicia) hospital between 1892 and 1898; 8915 patients received hospital treatment, and 11,892 were treated as out-patients. Glaucoma and lachrymal diseases were found twice as frequently in women as in men. Twenty-eight per cent. of all the patients had trachoma; 1023 extractions were done, and 1358 iridectomies.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

528. v. MICHEL, J. Contributions to the onkology of the eye. *Festschr. d. phys. med. Gesellsch.*, Würzburg, 1899, p. 147.

529. BIETTI. Anatomical investigations on the regeneration of the ciliary nerves after optico-ciliary neurectomy in man. *Graefe's Archiv*, xlix., p. 190.

530. ZIMMERMANN. On a case of resection of the superior cervical ganglion. *Ophth. Klinik*, 1899, No. 14.

531. HOFFMANN. On the existence and significance of the Koch-Weeks bacillus. *Zeitschr. f. Hyg. u. Infections. Kr.*, xxxiii., p. 109.

532. OERTZEN. On the presence of pneumococci on the normal human conjunctiva. *Zehender's klin. Monatsbl.*, xxiii., p. 432.

533. SCHANZ. On the diphtheritic inflammations of the conjunctiva. *Zeitschr. f. Augenheilk.*, ii.

534. HELBRON. A contribution to the subject of the action of naphthalin on the eye. *Ibid.*, p. 433.

535. NEUSCHÜLER. The effect of narcosis on ocular tension. *Bull. d. ocul.*, 1899, No. 16.

536. HEINE. Autoöphthalmoscopy in the inverted image. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 332.

537. MOHILLA. Reports on the open treatment of wounds after eye operations. *Ibid.*, p. 353.

According to BIETTI's (529) investigations, after optico-ciliary neurectomy there may be an extensive new-formation of nerve twigs from the central stump, which in spite of lack of coaptation penetrate the sclera through new as well as the old channels and provide even an excessive supply of nerves to the inner portions of the eye, particularly the ciliary body. Furthermore, a retrobulbar cicatrix-neuroma may be found whose numerous irregular fibres do not enter the sclera. A vicarious innervation on the part of the ciliary nerves could not be discovered.

In a case of chronic glaucoma in both eyes in which iridectomy and the use of eserine had been of no avail, ZIMMERMANN (530) extirpated the superior cervical ganglion. Immediately the pupil on the operated side contracted and the intraocular tension became diminished. The condition was permanent.

According to HOFFMANN (531) the Koch-Weeks bacillus causes an acute, and not rarely croupous, very contagious inflammation of the human conjunctiva. This acute inflammation may become chronic and lead to considerable papillary hypertrophy of the conjunctiva. In these folds the Koch-Weeks bacilli may long be retained, so that the communication of the disease is easy.

OERTZEN (532) found the pneumococcus in 4 per cent. of normal conjunctivas. It is therefore necessary in all operations

to wash out the conjunctiva with a mild antiseptic solution such as hydrarg. oxycyan. 1:3000.

HELBRON (534) gave to six rabbits a naphthalin-paraffin mixture 1:8. The first result was a marked hyperæmia of the choroid, ciliary body, and retina, and a less marked hyperæmia of the iris. Following these there appeared a serous or fibrino-serous exudation between the choroid and retina, on the retina, and in the vitreous. Later there was emigration of leucocytes. Finally cataract formed, but this was not due to the inflammatory processes.

NEUSCHÜLER (535), experimenting on rabbits and cats, has observed constantly an increase in the tension of the eye in narcosis.

MOHILLA (537) has practised the open treatment of the wound in 195 operations. According to his view the new system has not such advantages that the old is to be given up entirely, but as regards the patient there are many points in its favor.

III.—INSTRUMENTS AND REMEDIES.

538. DALÉN. On holocain and its action on the corneal epithelium and on the healing of corneal wounds. *Mitth. a. d. Augenkl. d. Carol. Med.-Chir. Instituts zu Stockholm*, ii., p. 1.

539. WEBER. The action of protargal in a case of blennorrhœa in an adult. *Wochenschr. f. Ther. u. Hyg. d. Auges*, ii., No. 42.

540. PERGENS. On argentamin. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 313.

541. LANGLE. A new apparatus for measuring regular astigmatism. *Ibid.*, p. 360.

DALÉN (538) states that holocain ½–1 per cent. dropped into the conjunctival sac produces in ½–1½ minutes complete anæsthesia of the cornea and conjunctiva, which lasts fifteen minutes. The drug has no effect upon the pupil, the accommodation, or the intraocular tension, nor does it produce anæmia. One objection to the use of the drug is its toxic effect, which is five times as great as that of cocaine. Furthermore, it more readily causes opacity of the cornea and loosening of the epithelium. No disturbing influence on the healing of corneal wounds had been observed.

According to PERGENS (540) there are two sorts of argentamin on the market which are to be distinguished as phosphor-argentamin and nitrargentamin.

Sections IV.–VII. Reviewed by DR. BERNHEIMER, Vienna.

IV.—ANATOMY.

542. BERNHEIMER. The purely anatomical proof of the existence of uncrossed optic-nerve fibres in man. *Arch. f. Augenheilk.*, xl., 2, p. 155.

543. KÖLLIKER. New observations on the anatomy of the optic chiasm. *Festschr. d. phys.-med. Gesellschaft, Würzburg*, 1899.

544. BALLOWITZ. On the corneal cells of man and the vertebrate animals. *Graefe's Archiv*, xlix., 1, p. 8.

545. KOSTER. Studies on the elasticity of the sclera. *Ibid.*, 2, p. 448.

BERNHEIMER (542) found the formation of medullary substance in the brain and visual tracts of an infant of ten days delayed and irregular. In numerous sections of the upper half of the chiasm only the uncrossed fibres had their medullary sheaths. Stained by Weigert's method, these fibres appeared isolated. It was therefore possible in perhaps twenty sections to trace single nerve fibres from one optic nerve into the tract of the same side. This was the first purely anatomical proof of the presence of uncrossed fibres in man, and this definitely ends the controversy in regard to their existence.

KÖLLIKER's (543) latest researches with the Golgi method on the sheep, cat, cow, dog, pig, and rabbit prove definitely that there are uncrossed fibres in the chiasm. In human preparations in which the Weigert medullary stain was used, Kölliker was unable to find any great number of uncrossed fibres, but he did not regard his observatious as conclusive.

BALLOWITZ (544) had made interesting experiments on the corneal cells in man and other vertebrates. He used most frequently sublimate or glacial acetic acid and sublimate hardening solutions,—those of Herrmann and Flemming. In all the corneal cells there is present a microcentre composed of two central bodies. The form of the nucleus and the form and size of the central bodies and microcentre vary greatly. The two appended

plates explain the details of these variations. It is probable that the differences thus revealed between the corneal cells and the leucocytes may prove to be of practical value in the study of inflammatory processes in the cornea.

V.—PHYSIOLOGY.

546. SACHS and WLASSAK. The optical localization of the median plane. *Zeitschr. f. Psych. u. Physiol. d. Sinnesorgane*, xx., 1, p. 23.

547. GOLOWIN. Investigations on the specific gravity of the aqueous humor. *Graefe's Archiv*, xlix., 1, p. 27.

548. SALZMANN. Vision in diffusion circles and the apparent accommodation of the aphakic eye in particular. *Ibid.*, p. 168.

549. VERWOOST. The reaction of the pupil in accommodation and convergence and following the illumination of areas of the retina of varying size with a constant amount of light. *Ibid.*, xlix., 2, p. 348.

550. HERTEL. On the results of the extirpation of the superior cervical ganglion in young animals. *Ibid.*, 2, p. 430.

551. HANSELL. Physiologic variations in the size of Mariotte's blind spot. *Am. Journ. of Ophth.*, Nov., 1899.

SACHS and WLASSAK (546) have studied the question of the conditions under which an object appears directly in front, rather than to the right or left. It was found that the localization of the middle did not depend upon the muscle-sense or the perception of motion.

GOLOWIN (547) made detailed investigations on the specific gravity of the aqueous humor of various living animals, using the pycnometer made by the Alvergmat firm in Paris.

The specific gravity in the normal eye was fairly constant,—for the dog, rabbit, and cat 1.008 or 1.009. The aqueous humor that collects immediately after evacuation is of greater specific gravity, resembling in this respect serous transudations. The osmosis of 5% salt solution from the conjunctival sac scarcely changes its specific gravity, although after removal of the corneal epithelium the specific gravity becomes higher. Subconjunctival injections of 5% salt solution do not change the aqueous. Immediately after death the specific gravity falls somewhat. In acute inflammatory glaucoma it is considerably increased.

In his studies of the pupillary reaction VERWOOST (549) has found that the reaction occurring as distant and near objects are fixed alternately, is associated with convergence and not with accommodation. Other experimenters had erred in the matter for the reason that an alteration in convergence had not been wholly excluded. The light reaction depends upon the total quantity of light which enters the eye, no matter how large or small a portion of the retina it may be distributed over.

HERTEL (550) removed the superior cervical ganglion from young animals in order to study the influence of the lesion upon the growth of the eye and the condition of the intraocular tension; 31 rabbits were operated on at an age of 10–20 days. The well-known transitory ocular signs of section of the sympathetic were observed, but it was found that the lesion of the sympathetic did not affect the development of the rabbit's eye. An hour after the operation the eye of the operated side showed a marked hypotony. This soon disappeared, and in five days at the longest the tension became equal in the two eyes.

HANSELL (551) has examined the "blind spot" in 37 pairs of emmetropic eyes, 11 pairs of hyperopic eyes, and 4 pairs of myopic eyes in intelligent persons, and finds that in the emmetropic eyes the average distance from the point of fixation was 8 *cm* when the examination distance was 33 *cm*. The average distance for H. was about the same, while in M. it was fully 5 *mm* greater. The middle of the blind spot was below the point of fixation. In H. and Em. it averaged 10 *mm*; it was 1 *mm* less in M. In M. the long diameter of the oval was 38 *mm*, in H. 34 *mm*, in E. 31 *mm*.

VI.—REFRACTION AND ACCOMMODATION.

552. HEINE. Further contributions to the anatomy of the myopic eye. *Arch. f. Augenheilk.*, xl., 2, p. 160.

553. HESS. Studies on accommodation, v. *Ibid.*, p. 241.

554. VON HIPPEL, A. The permanent results of the operation for myopia. *Ibid.*, p. 387.

555. GERHARDT. Report on 52 operations for myopia. *Inaug. Dissert.*, Giessen, 1899.

556. HÜBNER. The operative treatment of myopia of high degree. *Sammlung zwangloser Abhandl. a. d. Geb. d. Augenheilk.*, edited by Vossius, iii., 3, Halle, Marhold, 1899.

557. JACKSON. Management of cases of high asimetropia. *Journ. Amer. Med. Assoc.*, Dec. 2, 1899.

558. CLARK. Astigmatism after cataract extraction. *Annals of Ophth.*, Oct., 1899.

559. TIMBERMAN. Excessive myopia; when may we operate and what may we expect? *Journ. Amer. Med. Assoc.*, Nov. 4, 1899, and *Annals of Ophth.*, Oct., 1899.

560. SCHNEIDEMANN. Very high astigmatism. *Journ. Amer. Med. Assoc.*, Dec. 9, 1899.

HEINE (552) has had opportunity to make further microscopic examinations of myopic eyes. Six carefully studied eyeballs have shown him that the appearances of distortion at the optic-nerve entrance are brought about by the different relations of the sclera, choroid, and retina on one hand, and the lamina elastica on the other, to the forces which keep tense the posterior segment of the ball. In the peculiarity of the coats of the ball and their different conduct when the volume of the ball increases, lies the occasion of the conus formation. Even in the formation of a pure conus without atrophy of the choroid, the author's specimens indicate that we must assume a pressure or distortion atrophy of the choroid in the region of the conus.

HESS (553), in his fifth paper on the subject of accommodation, reports observations upon the near point. He found, first, that for scientific purposes the usual method of regarding the apparent and the actual near point as identical is not satisfactory, since his own near point determined by the usual method differs 1. D. from the near point as determined according to Scheiner's principle.

By methods which are above criticism he found that in his own eye the action of eserine did not perceptibly bring the actual near point closer. Finally, he showed by new experiments that the binocular and uniocular near point lie equally distant from the eye.

v. HIPPEL (554) reported on 188 eyes operated on for myopia in the last 6½ years. Of these, 184 were examined again after a lapse of 1–6 years; 11, or 6 %, subsequently had detachment of the retina which may be considered spontaneous. v. Hippel regards the operation as justifiable only when the patient is incapacitated for work by his myopia, even when the correcting glasses are worn. Myopes under thirty years of age were operated on by discission and subsequent linear extraction, and

those over thirty with a transparent lens by flap extraction without iridectomy. Secondary cataracts were cut through with the Esberg-Luer scissors-forceps.

GERHARDT (555) reports on 52 myopia operations done by Vossius, in 50 of which the result was in every respect good. One eye was lost by infection and one, previously diseased, by detachment of the retina.

According to HÜBNER (556), in the operation for myopia not only is the degree of myopia important but also the individual conditions in each particular case. In general the lowest limit is 14. D, but under certain conditions eyes with only 12–10. D may be operated on. In performing the operation special care is to be taken to avoid prolapse or loss of vitreous. Therefore the posterior capsule is to be protected carefully. The operation gives the highly myopic person a better acuteness of vision for distance and the ability to see well and without fatigue at every working distance that his employment may require. In the great majority of cases the progress of the myopia can be checked by the operation, but as regards the lessening of the danger of detachment a conclusive judgment cannot yet be given.

Under asimetropia JACKSON (557) would range greatly differing degrees of astigmatism as well as spherical ametropia. Each case should be made a study for itself, but he believes that with care and patience a large number of cases can be fitted with complete correction for each eye. This is, of course, more applicable to young people. BURNETT.

CLARK (558) gives the statistics of thirty cases of extraction with astigmatism following at various periods after the operation. Comparing his own averages with those of Lippincott, who makes a small preliminary iridectomy, he finds that with the simple method he employs, the astigmatism is higher. BURNETT.

In giving a general consideration to the subject of operations in high myopia, TIMBERMAN (559) relates a case of his own of a woman of thirty-five who had a myopia of —16 in R eye, which also deviated outward, condition of other eye not given. With the —16 V = $\frac{5}{xx}$. A discission was made and the lens evacuated after it had caused considerable disturbance. A tenotomy was also made. With +2.5 V = $\frac{5}{5}$ after the effect of the operation had subsided. BURNETT.

SCHNEIDEMANN (560) reports a case of very high astigmatism as determined by the shadow-test; R, +2 D — 20, 15°; L, + 2 D

— 20, 178°. With these, vision was advanced from $\frac{1}{10}\frac{8}{0}$, to $\frac{1}{3}\frac{8}{0}$ R, $\frac{1}{4}\frac{8}{0}$ L. It is to be regretted that no measurement of the cornea is given. BURNETT.

VII.—MUSCLES AND NERVES.

561. SCHOUTE. A contribution to the knowledge of the torsion movements of the eye. *Med. Weekblad*, vi., p. 604.

562. PANAS. Motor ocular paralyses of traumatic origin. *Arch. d'opht.*, xix., 11, p. 623.

563. KUNN. On disassociating ocular paralyses. *Beiträge z. Augenheilk.*, 41, p. 44.

564. BACH. Further investigations on the nuclei of the oculomotor nerves. *Graefe's Archiv*, xliv., 2, p. 266.

565. ROOSA. Concerning convergent strabismus. *The Post-Graduate*, Dec., 1899.

SCHOUTE (561) arranged the Muller apparatus so that both eyes could be measured simultaneously. The torsion was almost always alike in the two eyes. When the head was turned to the right or the left a symmetrical torsion occurred.

WESTHOFF.

As PANAS (562) stated in his paper before the International Ophthalmological Congress, the paralyses of the ocular muscles which arise from injury of the muscle are due in most cases to a stretching of the muscle fibres and perhaps of the nerves also, and not to a rupture of the muscle or detachment of its tendon, which cannot be produced experimentally in the dead subject. The paralyses of the ocular muscles due to fractures of the base are mostly of the abducens, which passes by the apex of the petrous portion of the temporal bone, the usual site of fracture, and therefore, as well as on account of its close connection with the wall of the inferior petrosal sinus, is especially endangered. The abducens is compressed either by the bone or by hemorrhage. In the former case the paralysis is immediate, in the latter, as in traumatic meningitis, it appears later. Inconstancy of the paralysis and its late appearance do not therefore indicate a nuclear lesion. The paralysis in children under ten years of age arises from hemorrhage and not from fracture, which cannot be produced in the dead subject or by the greatest compression with the forceps in the bodies of new-born infants. In such cases there is only meningeal hemorrhage, such as occurs in prolonged labor in primiparæ and after the use of forceps, and causes a paralysis of the

abducens, followed by a congenital squint, which according to statistics is not rare. The latter usually disappears within the first two years of life, but may persist to a later age.

v. MITTELSTADT.

KUNN (563) offers a number of case histories in which paralyses of the ocular muscles were observed with evident loss of association of greater or less degree. The author terms this form dissociating paralysis. Apart from a simple or multiple paralysis, causing a loss of mobility in the direction of the action of the paralyzed muscle or muscles, there is a disassociation of other coordinated movements of the two eyes. Thus one eye performs movements in which the other eye does not take part, although except for this paralysis it had the power to do so. Almost all these paralyses were found in tabic patients.

According to BACH'S (564) investigations on man, monkeys, cats, mice, fishes, lizards, and various birds, the nucleus of the trochlearis is round or oval. It lies in opposition to the dorsal margin of the posterior longitudinal bundle. The fibres emerging dorso-lateral from the trochlearis nucleus apparently decussate completely. The trochlearis nucleus lies next the oculomotor nucleus.

HORSTMANN.

ROOSA (565) is among those who believe in *amblyopia ex anopsia* and consequently advocates correcting the defect of strabismus as early as possible, first giving glasses as early as the 2d or 3d year, and then, if the anomaly is not abolished by this, making a tenotomy as early as the 4th year. He advocates the Panas method of stretching the muscles before tenotomizing.

BURNETT.

Sections VIII.–XII. Reviewed by DR. R. SCHWEIGGER, Berlin.

VIII.—LIDS.

566. MULDER. Blepharitis ciliaris and acarus folliculorum. *Ned. Tydschr. v. Geneesk.*, 1899, ii., p. 803.

567. WARSCHOWSKI. On the question of the relation of blepharitis to hyperopia. *Zehender's klin. Monatsbl.*, xxxvii, p. 476.

568. HOTZ. On blepharitis and hyperopia. *Ibid.*, p. 485.

569. FORTUNATI. A modification of Oettinger's procedure

for the relief of total trichiasis. *Bull. d. R. Accad. med. di Roma*, xxv., 3–7.

570. Schaefer. On the trichiasis operation with a pedunculated flap from the skin of the lid. *Inaug. Dissert.*, Giessen, 1899.

571. Roselli. Blepharoplasty done by a modified Dieffenbach process. Considerations on plastic operations on the lower lid. *Bull. d. R. Accad. med. di Roma*, xxv., 3–7.

572. Schmidt-Rimpler. Fat hernias of the upper lid. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 297.

573. Werner. Cases of congenital coloboma of the lower lid. *Inaug. Dissert.*, Tübingen, 1900.

574. Würdemann and Murray. Serpiginous syphilide of eyelid, forehead, and external nose. *Ophth. Record*, Nov., 1899.

575. Hotz. Total symblepharon of the upper lid relieved by Thiersch skin-grafting. *Ophth. Record*, Nov., 1899.

Mulder (566) found balsam of Peru to be valueless in cases of acarus of the lid margin.

Warschowski (567) made the same observation as Winselmann and regards as an etiological factor in producing the blepharitis that congestion of the eye which follows long-continued strain of the accommodation and often appears as a chronic hyperæmia of the conjunctiva.

According to Hotz (568), the correction of hyperopia for the relief of blepharitis, which Winselmann has lately recommended, was advised by Roosa in 1876 (furthermore it was known of in Germany in 1867 as the journals show) and is habitually practised everywhere in America.

Fortunati (569) adds to the splitting of the lid according to Oettinger two incisions vertically upward, about 8 *mm* long, which permits of great displacement of the portion containing the ciliary margin, particularly at its ends. Krahnstöver.

Schaefer (570) gives a favorable report of the results obtained in the Giessen eye clinic by treating trichiasis by the implantation of simple or doubly pedunculated skin flaps into the intermarginal portion of the lid. The lanugo hairs upon the transplanted skin cause no trouble. 19 % of the patients operated on had been treated or operated on elsewhere, 5 % returned on account of relapses and were then treated by electrolysis or excision of the lashes.

Roselli (571) has slightly modified Dieffenbach's operation for cicatricial ectropium. Krahnstöver.

SCHMIDT-RIMPLER (572) removed a fat-containing fold of skin from both upper lids of a boy of nineteen. The swelling beneath the skin had varied in size and at the operation it was found to be continuous with the orbital fat through a defect in the orbicularis muscle that was probably congenital.

According to WERNER (573) coloboma of the lower lid, like coloboma of the upper, together with other anomalies of the eye and the neighboring region, is mostly the result of amniotic adhesions.

The interesting feature of the case reported by WÜRDEMANN and MURRAY (574) is that the serpiginous ulceration of the eyelid, forehead, and nose was first considered, from a lack of definite history, to be tuberculosis or lupus and so treated, once by a Thiersch graft, and administration of the mercuric bichloride. As they finally healed on increasing doses of the iodides, it is presumed that they were specific in spite of lack of definite data.

BURNETT.

HOTZ (575) reports another case in which he has successfully used a Thiersch graft for replacing the conjunctiva, after piercing the globe, in total symblepharon. The peculiarity of its application in this case is that the graft was applied over a thin plate or disk of lead which had been moulded to the form of the eyeball. This was inserted under the upper lid with the epithelial surface next the lead and the lid firmly fixed by sutures and a compress bandage. On removal of the bandage at the end of four days union of the graft was perfect. Some contraction took place, and a second graft was applied after mobilizing the upper lid. The patient can now wear an artificial eye. BURNETT.

IX.—LACHRYMAL APPARATUS.

576. GALLENGA. On chronic dacryocystitis from rhino-scleroma. *Centralbl. f. prakt. Augenheilk.*, xxiii., p. 289.

577. STRZEMINSKI. A case of polypus of the lachrymal sac. *Graefe's Archiv*, xlix., 2, p. 339.

Affections of the lachrymal sac in cases of rhino-scleroma are in part an extension of the process from the nose and in part an ordinary dacryocystitis in consequence of stoppage of the lower portion of the duct. In such a case GALLENGA (576) found peculiar changes in the mucosa of the sac which could not be considered rhino-scleroma but which would probably have led to

it. The typical histological changes in the palpebral conjunctiva, which clinically resembled amyloid, have been described by Ewetzky, who found the bacilli present (*Beitr. z. Augenheilk.*, iii., 22, 1898).

According to STRZEMINSKI (577), polyps develop in the lachrymal sac only on a mucosa with chronic catarrh and a tendency to papillary proliferation. Besides the symptoms of simple catarrh of the sac, there is then a solid swelling of the region of the sac which cannot be changed by compression, but this condition is also found in cases of thickening of the entire mucosa or the walls of the sac. These polyps are very rare.

X.—ORBIT AND NEIGHBORING CAVITIES.

578. WERNICKE. Hydatid buzzing with echinococcus of the orbit. *Centralbl. f. prakt. Augenheilk*, xxiii., p. 304.

579. ISSEKUTZ. Retrobulbar echinococcus. *Ungar. Beiträge zur Augenheilk.*, ii., p. 53.

580. GALLENGA. A contribution to the study of the congenital tumors of the orbit (congenital fibro-lipoma). *Arch. di Ottalm.*, 1899, vi., 5.

581. HITSCHMANN. A case of intermittent exophthalmus with extensive phlebectasiæ in the jugular veins. *Wiener klin. Wochenschr.*, 1900, No. 3.

582. GRUNERT. A new plastic method after the complete chiselling out of the frontal sinus for empyæma. *Münch. med. Wochenschr.*, 1899, No. 48, p. 1611.

583. ESCHWEILER. On empyæma of the frontal sinus. *Inaug. Dissert.*, Giessen, 1899.

584 OLIVER. Description of a new method for implantation of glsss balls into the orbital cavity. *Philada. Med. Journ.*, May 27, 1899.

585. DAVIS. Report of a small round-celled sarcoma of the orbit and neighboring sinuses in a child: metastasis, exhaustion, death. *The Post-Graduate*, Dec., 1899.

586. BRYAN. On the relation of the accessory cavities to diseases of the eye. *Journ. Amer. Med. Assoc.*, Nov. 11, 1899.

587. AYRES. Traumatic enophthalmus. *Amer. Journ. of Ophth.*, Nov., 1899.

In WERNICKE's (578) patient, exophthalmus and amblyopia had been increasing for six months. When the lids were closed tightly the patient heard for 5–8 seconds a loud buzzing sound. This could be heard by others when the ear was laid against the temple, but nothing could be felt. The diagnosis of echinococcus of the orbit was confirmed by operation.

ISSEKUTZ (579) described two cases of echinococcus of the orbit in children. The new formations had caused exophthalmus, pain, and diminution in vision. The operation wound healed smoothly after the vesicles had been incised.

ESCHWEILER (583) presents nine case histories of empyæma of the frontal sinus, due in four cases to influenza, in one case to measles, in one to trauma, and in two to chronic rhinitis. All the cases were in an advanced stage, with abscess formation particularly in the upper lid and once in the orbit. In six cases the eyes were affected secondarily, but were mostly restored after the operation on the sinus.

OLIVER's (584) method of implantation of a glass ball into the capsule of Tenon after enucleation, consists in suturing the recti muscles with catgut sutures before the section of the tendons, in such way that after the detachment from the ball and the enucleation of the eye they can be brought easily over the implanted glass ball and be exactly in the line of their normal action. The conjunctiva, after being properly trimmed, is brought together with silk sutures. BURNETT.

The case reported by DAVIS (585) confirms the opinion now generally held, that interference with malignant growths of the orbit and adjacent sinuses in children (his patient was two and a half years old) only hastens their development and growth. The tumor was a small round-cell sarcoma. There was no autopsy.
BURNETT.

In this paper, which is general in its character, BRYAN (586) discusses the relations of diseases of the accessory cavities, particularly the frontal and ethmoidal sinuses, to affections of the eyes, and relates in that connection the histories of the following cases: 1. Chronic frontal sinusitis, caries of the fronto-ethmoidal cells, orbital abscess, fistulous opening at the inner angle of the orbit. 2. Chronic frontal suppurating sinusitis and suppurating ethmoiditis, associated at one time with a pronounced orbital cellulitis. 3. Chronic abscess of the frontal sinus and ethmoidal cells followed by an irido-choroiditis. In all

cases of ethmoidal trouble he states that he has found some restriction of the visual field, diagrams of which are given in illustration. 4. Nasal polypi, alveolar sarcoma of the ethmoidal cells, later involving the orbit, purulent accumulation in the antrum. 5. Abscess of the sphenoidal sinus, associated with paralysis of both external recti. The operation for opening the abscess was followed by a cure of the paralysis of the right externus, but not the left. BURNETT.

AYRES's (587) case of enophthalmus was in a man of thirty-five years, who was struck over the supraorbital region of the right angle with a broom handle ten months before. There followed severe swelling of the lids and orbital tissue. When the inflammation subsided the eye was found to have receded into the socket; motion inward unimpaired, outward limited, upward limited, downward abolished; media clear, od pale, V $\frac{1}{20}^{5}_{6}$, no rupture of choroid or detachment of retina. There was bleeding from the nose after the injury. This corresponds closely to a similar case reported in the same journal for July, 1899, by the reviewer.

BURNETT.

XI.—CONJUNCTIVA.

588. HAUER. On atropine conjunctivitis. *Ungar. Beitr. z. Augenheilk.*, ii., p. 247.

589. MARK. Clinico-experimental studies on so-called atropine conjunctivitis. *Ibid.*, p. 223.

590. SILEX. On the therapy of spring catarrh and of the conjunctivitis accompanying hay fever. *Die aerztl. Praxis*, 1899, No. 20.

591. FEUER. The operative treatment of trachoma. *Ungar. med. Presse*, 1899, No. 42–43.

592. TERSON, Sr. Granular conjunctivitis with complete pannus, cured by jequirity after the ordinary treatment had failed. *Ann. d'Ocul.*, cxxii., Nov., p. 322.

593. BADE. On primary tuberculosis of the conjunctiva. *Inaug. Dissert.*, Tübingen.

594. COPPEZ. A study of ocular diphtheria. *Arch. d'opht.*, xix., 10, p. 565.

595. BRECHT. The bacteriology of conjunctivitis. *Charité-Annalen*, xxiv., p. 376.

596. VAN FLEET. Purulent ophthalmia in private practice. *The Post-Graduate*, Dec., 1899.

597. HENDERSON. A case of tuberculosis of the conjunctiva. *Amer. Journ. of Ophth.*, Oct., 1899.

HAUER (588) and MARK (589) could not produce atropine conjunctivitis by using a ½–1 % solution on the normal conjunctiva, but readily produced it by using atropine in substance for twelve days on the normal conjunctiva, and often by making a single application to the irritated or wounded conjunctiva. It is, therefore, the high concentration of the atropine that causes the trouble.

FEUER (591) regards the operative treatment of trachoma by Heisrath's method as a great advance in the therapy of the disease, and states its indications as follows:

1. Pannus, when unrelieved by the ordinary treatment.

2. Thickening of the curved margin of the upper cartilage and the overlying conjunctiva in cases that are healed or nearly so, especially when the patient has no opportunity for regular treatment.

3. Curvature of the cartilage, so that the portion of the orbicularis lying in an oblique plane contracts and presses the inner margin of the lid upon the cornea. A few days after the operation, the eye opens freely and the cornea is smooth and lustrous.

4. Ptosis following trachoma, in consequence of the affection of Müller's muscle by the chronic inflammatory process. The author believes that this excision of the cartilage could be used in idiopathic ptosis, for which no altogether satisfactory operation has yet been devised. HERRNHEISER.

COPPEZ (594), in a very interesting paper based on recent reports and his own experiences, discusses in a clear and comprehensive manner the still disputed question as to the identity of croup and diphtheria of the conjunctiva; the distinction between the Loeffler bacillus and the other bacilli found in the conjunctival sac under normal and pathological conditions; and finally the action of toxines upon the cornea. The details must be read in the original.

BRECHT (595) reports on a case of mixed infection with the pneumococcus and the diphtheria bacillus, a case in which pseudogonococci were found, a case of a child with gonorrhœal conjunctivitis with gonococci in the nasal pus, and finally the case of a boy in whom a gonorrhœal conjunctivitis was twice followed by

an acute hemorrhagic nephritis with gonococci in the urine, which the author regards as metastatic.

Of the nine cases which form the basis of VAN FLEET'S (596) paper, eight were oph. neonat., and the remarkable feature of their histories is that it is stated that in all eight the method of Crede had been used. This must certainly be an erroneous statement or the method was very inefficiently applied. As the author says, very properly, it is necessary that it be done *secundum artem* to be absolutely sure. BURNETT.

HENDERSON (597) reports a case of tuberculosis ulcer in the conjunctiva of the lid of a woman of fifty-six, who was suffering from tuberculosis of the lungs. Giant cells and the bacillus were found in the discharge and also in the tissue which was removed. Cauterization of the parts after excision of the diseased tissue was followed by a healing of the ulcer. BURNETT.

XII.—CORNEA.

598. DIMMER. On superficial grill-like opacity of the cornea. *Zeitschr. f. Augenheilk.*, ii., p. 354.

599. WICHERKIEWICZ. A fungus affection of the cornea. *Arch. f. Augenheilk.*, xl., 4, p. 361.

600. STRAUB. Treatment of ribbon-shaped keratitis. *Ned. Tijdschrift v. Geneeskunde*, 1899, ii., p. 593.

601. HIPPEL, E. Ulcer of the posterior surface of the cornea (Ulcus internum corneæ). A contribution to the knowledge of congenital opacities of the cornea and of megalophthalmus and hydrophthalmus. *Festschrift für A. v. Hippel*, Halle, Marhold, 1900.

602. COPPEZ, H. The action of certain toxines on the cornea. *Gaz. hebdom.*, 1899, 1172, and *Jour. méd. de Bruxelles*, 1899, No. 35. Cf. *Arch. f. Augenheilk.*, xl., 2, 199 and 1, 104.

603. BLASKOWICZ. The tumors of the cornea. *Ungar. Beitr. z. Augenheilk.*, ii., 131.

604. DEMICHERI. Papilloma of the cornea. *Arch. d'opht.*, xix., 10, p. 561.

605. KRUKENBERG. Further reports on congenital bilateral melanosis of the cornea. *Klin. Monatsbl.*, xxxvii., p. 478.

606. KETTERL. Two cases of cilia in the anterior chamber. *Inaug. Dissert.*, Munich, 1889.

DIMMER (598) observed three cases of grill-like opacity of the cornea in three sisters between forty-seven and fifty-seven years of age, who had had the affection for twenty or thirty years. He obtained a history of chronic catarrh only, probably conjunctival ; there were no scars in the corneæ. The corneæ were uneven from the deposition in them of punctate hyaline masses, and crystals in the stroma of the cornea and Bowman's membrane were arranged in a meshwork, giving the effect of fissures. The disturbance of vision was considerable.

In WICHERKIEWICZ'S (599) patient, after a trauma, there developed a thick white mass on the cornea with vascularization of the margin and hypopyon. The irritation was only slight, but the vision was much reduced. The mass on the cornea was composed of penicillium glaucum adhering to the surface of the cornea without entering the tissues, and disappeared after removal of a portion.

According to STRAUB (600), in ribbon-shaped keratitis there is a deposit in the epithelium of colloid, hyalin, or lime. This deposit can be shaved off with a Graefe knife, and the cornea then becomes covered with a healthy epithelium. WESTHOFF.

HIPPEL (601) observed in young infants with abnormal corneæ large, cloudy, conical ulcers, staining with fluorescein, on the posterior surface of the cornea, without vascularization or change in the superficial epithelium. The disease is distinguished from parenchymatous keratitis by the fact that it begins at the margin. It is frequently familial and as a rule bilateral. A cornea thus affected may become normal again.

BLASKOWICZ (603) reports a case of granuloma and gives a résumé of the literature of primary tumors of the cornea, *i. e.*, those not due to extension from other tissues. These are : (1) granuloma, which arises in the stage of repair of corneal ulcers or through the accumulation of lymph cells at some point in the cornea; (2) keloid and connective-tissue hyperplasias, partly of myxomatous structure; (3) fibroma lipomatodes, (4) melanosarcoma, and (5) dermoid.

DEMICHERI (604) removed from a man of sixty, who had previously suffered from trachoma, a papilloma which, in the form of a bilobulated tumor, occupied the upper third of the cornea. The neighboring conjunctiva was quite vascular, but otherwise unaffected. After the first removal there was speedy recurrence. The tumor was readily peeled off the cornea and was firmly

attached at the limbus only. It was composed almost exclusively of cells without any remains of Bowman's membrane. Its structure was that of slight papillæ of connective tissue and blood-vessels surrounded by a proliferating layer of cylindrical cells and superficial layers of flatter cells. v. MITTELSTAEDT.

KRUKENBERG (605) reports two further cases of brownish discoloration of a vertically oval area in the middle of the cornea. He takes this to be a product of abnormal development of the anterior portion of the uveal tract.

Sections XIII.–XVIII. Reviewed by DR. O. BRECHT, Berlin.

XIII.—LENS.

607. KNAPP, P. Experimental investigations on the procedures for producing cataract artificially without rupturing the anterior capsule. *Zeitschr. f. Augenheilk.*, ii., p. 553.

608. SCHMIDT-RIMPLER. On binocular and stereoscopic vision, with unilateral aphakia and unilateral acuteness of vision, as regards accident legislation. *Weiner med. Wochenschr.*, xlix., No. 43, p. 1975.

609. GUTMANN, G. On the operative treatment of complicated cataract. *Arch. f. Augenheilk.*, xl., p. 238.

610. BAKER. A case in which both eyes were lost from choroidal hemorrhage subsequent to the extraction of senile cataract. *Annals of Ophth.*, Oct., 1899.

611. THEOBALD. Report of one hundred consecutive cases of cataract extraction. *Amer. Jour. of Ophth.*, Dec., 1899.

P. KNAPP'S (607) experiments lead him to regard the operation recommended by Jocqs (injection of aqueous humor into the lens with a hypodermic syringe) as much more difficult technically and more dangerous than simple discission.

According to SCHMIDT-RIMPLER (608) aphakic patients, notwithstanding good sight with correcting glasses and the existence of binocular vision, have not an exact perception of depth, and children are even more uncertain than adults. On the other hand, the disturbance in the estimation of depth when the vision of one eye is even considerably reduced, is mostly slight, or is not perceptible.

GUTMANN (609) finds that in 75 per cent. of 45 operations for complicated cataract a more or less considerable increase in vision was obtained.

In the case related by BAKER (610) the first eye was lost on the sixth day after extraction, from intraocular hemorrhage. A year later the patient desired the other eye to be operated upon. Every precaution against hemorrhage was taken. The patient was kept perfectly quiet and carefully watched after the extraction, which had been preceded some weeks by an iridectomy that had pursued a normal course. Within an hour she suddenly complained of intense pain, and on removing the dressing the vitreous was found hanging in the wound, pushed out by blood from behind. Immediate enucleation was declined. BURNETT.

Of the 100 extractions tabulated by THEOBALD (611), 52 were Graefe, 26 with preliminary iridectomy, 20 simple, and 2 in the capsule (dislocated lenses). He has practically abandoned the simple method, doing a small iridectomy. There were 90 successes, and 2 losses from suppuration, both complicated cases. BURNETT.

XIV.—IRIS.

612. Cox, G. H. Total aniridia; two cases—one traumatic, one (with ectopia lentis) congenital. *Med. Record*, Dec. 16, 1899.

613. BEARDSLEY. Introversion of the iris. *Amer. Jour. of Ophth.*, Oct., 1899.

614. AYRES. Serous cyst of iris following discission for milky cataract. *Jour. Amer. Med. Assoc.*, Nov. 18, 1899.

The case of traumatic aniridia, reported by COX (612), is interesting, in so far as the wound in the sclero-corneal junction was very small, and no trace of the iris was seen immediately after the injury, or at any subsequent time. The disappearance of the iris tissue was total. In the congenital case, which was double, there was associated an upward dislocation of the cataractous lenses. BURNETT.

In BEARDSLEY'S (613) case, a man of thirty-four years was struck violently on the eye. Ant. chamb. was filled with blood and there was a scar on the upper part of the cornea. Iris not visible, neither were the ciliary processes. The lens was absorbed. Some floating opacities in the vitreous. Final vision, with + 12 = $\frac{5}{15}$. He records another similar case of retroversion of iris with dislocation of lens from a blow. Communicated by Dr. Barcle. BURNETT.

In AYRES'S (614) case a boy of six was operated on, for lamellar cataract, by iridectomy in 1880. It 1895 the cataracts had

matured and were incised and absorbed successfully. In 1897 a cyst about 5 *mm* in diameter was found on the iris of the right eye at the lower-inner quadrant. A piece of the iris containing the cyst was excised. Vision, however, gradually failed, probably from some slow degenerating process. BURNETT.

XV.—CHOROID.

615. POWELL. A contribution to the knowledge of choroidal sarcoma. *Graefe's Archiv*, xlix., p. 71.

POWELL (615) reports on 100 cases, comprising 0.07 % of the total number of policlinic cases. The most frequent age was fifty-one to sixty years, the youngest patient was seven. 47 % were men, 53 % women. The tumor originated in the iris in 2 %, ciliary body 10 %, and choroid 88 %, and was almost without exception unilateral. It is noteworthy that leucosarcoma is found mostly in the anterior portion of the uveal tract and melanosarcoma in the posterior. The average age of the patient with leucosarcoma was 34.67 years, and of the patient with melanosarcoma 48.7 years, the former appearing earlier in life. Anatomically, 5 % are pure round-celled sarcomas. Etiologically, trauma cannot be considered a sufficient cause for the growth. Prognostically, sarcoma of the iris is not so bad as the others, since it is discovered early and perhaps may be cured by iridectomy. 10 % of the patients operated on suffered relapses mostly within six months, once thirty years later in the stump remaining after enucleation. The patient who has no recurrence within four years can be counted definitely cured. [Death from metastasis has occurred as late as fourteen years.—H. K.] Curiously, metastases were relatively more frequent in the patients operated on early.

XVII.—GLAUCOMA.

616. TERRIEN. The effect of posterior sclerotomy in glaucoma. *Arch. d'opht.*, xix., 12.

617. DOMEC. The treatment of glaucoma by massage. *Clin. Ophth.*, No. 19, p. 221.

618. ALLARD. The treatment of chronic glaucoma by galvanization of the cervical sympathetic. *Ibid.*, No. 20, p. 229.

619. JATROPOULIS. A case of unilateral glaucoma with resection of the superior cervical ganglion. *Ibid.*, p. 233.

620. ROGMAN. Is iridectomy of service in simple chronic glaucoma? *Ibid.*, p. 231.

621. ZIMMERMANN (Stuttgart). A case of resection of the superior cervical ganglion of the sympathetic. *Ibid.*, p. 232.

622. DE SCHWEINITZ. An analysis of 63 eyes affected with chronic glaucoma, with special reference to the visual field. *Annals of Ophth.*, Oct., 1890.

623. RISLEY. Glaucoma in an aphakic eye three years after extraction. *Amer. Journ. of Ophth.*, Nov., 1899.

624. SUKER. Excision of the superior cervical ganglion of the sympathetic for glaucoma, with a report of a case. *Ophth. Record*, Oct., 1899.

625. RICHEV. The nature of acute and of chronic glaucoma. Their common origin. *Philada. Monthly Med. Journ.*, July, 1899.

TERRIEN (616) found in an eye in which posterior sclerotomy had been done twice for hemorrhagic glaucoma with transitory effect, that the wound in the sclera, choroid, and retina had remained open although the enucleated eye was very hard. Terrien would explain this hardness by an œdema of the vitreous, and believes that in cases like this in which iridectomy and anterior sclerotomy had not relieved the tension, the most rational procedure would be the removal of a portion of the vitreous.

v. MITTELSTÄDT.

Nothing more than the gist of the résumé of the exhaustive study of the visual field in glaucoma made by DE SCHWEINITZ (622) can be given here. While in the typical cases of chronic glaucoma the nasal half of the field is first affected—a composite picture of a number of fields will show a general restriction rather than a restriction in one direction. The color fields are usually more contracted proportionately than the field for form. The scotomas, which can usually be found by careful examination in a subdued light, may be ring-shaped, crescentric, paracentral or disseminated, and are frequently the forerunners of large defects. The cases are well tabulated and there are forty-five diagrams of visual fields given. BURNETT.

In the case detailed by RISLEY (623) the operation was a simple extraction, in which, however, the iris became adherent to the capsule and when the first attack of glaucoma occurred three years after the extraction (during which time V was good, being

⅔ after a capsulotomy, made six months after the first operation), the iris was *bombé* and evidently pressing on Fontana's space. The first attack of glaucoma was cured by eserine, rest in bed, and salicylate of soda. Six months later, however, another attack of glaucoma necessitated an iridectomy, the result of which has been satisfactory so far. V is now ⅔.

BURNETT.

SUKER (624) reports a case of removal of the superior cervical ganglion in a case of glaucoma, which had already been operated upon by iridectomy, giving temporary relief. The pain returned with increased severity and yielded to none of the ordinary remedies. The removal of the ganglion gave relief to the pain up to the time of reporting (less than three months). The tension was reduced. BURNETT.

RICHEY (625) reports six cases of glaucoma in support of his contention that glaucoma is a manifestation of gout.

BURNETT.

Sections XIX.–XXII. Reviewed by PROF. GREEFF, Berlin.

XIX.—RETINA AND FUNCTIONAL DISTURBANCES.

626. MUNTENDAM. A case of quinine blindness. *Ned. Oogheelkundige Bydragen*, Abl. viii., p. 73.

627. STRAUB. Blindness from quinine poisoning. *Ned. Tydschr. v. Geneeskunde*, 1899, ii., p. 744.

628. MICHEL. On affections of the retinal vessels with particular reference to the pathological changes. *Zeitschr. f. Augenheilk.*, ii., July, 1899.

629. SEYDEL. On disturbances of circulation in the retina. *Ibid.*, Oct.

630. BULL. Pathological changes in the retinal vessels. *Tidskr. for den norske Lageforening*, Jan. 15, 1900.

631. SCHROEDER. Pathogenesis and therapy of spontaneous detachment of the retina. *Zeitschr. f. Augenheilk.*, ii., July, 1899.

632. SILEX. A contribution to the knowledge of some rare anomalies of vision. *Ibid.*, Aug.

633. RAEHLMANN. On relative and absolute lack of color perception. *Ibid.*, ii., Oct. and Nov.

634. DRUAULT. A case of detachment of the retina followed by glaucoma. Ulcer of the cornea coming on some days before enucleation. *Arch. d'opht.*, xix., 11, p. 625.

635. BURNETT. A case of obstructed retinal circulation with a series of pictures showing the changes in the vascular system during the re-establishment and the formation of new vessels in the retina. *Ophth. Record*, Dec., 1899.

636. FOX, W. H. Injuries to the eyes from electric light flash. *Jour. Amer. Med. Assoc.*, Oct. 7, 1899.

637. GIFFORD. Thrombosis or embolism of the central artery of the retina after ligation of the vessels of the neck. *Ophth. Record*, Dec., 1899.

638. PATILLO. Two cases of methyl alcohol amaurosis from inhalation of the vapor. *Ibid.*

639. HOLDEN. The pathology of the amblyopia following severe hemorrhage and that following the ingestion of methyl alcohol, etc. *Arch. f. Augenheilk.*, xl., p. 351.

640. MOORE. A clinical lecture on hysterical blindness. *The Post-Graduate*, Dec., 1899.

641. NELSON. Temporary blindness after intense inflammation—result of lightning. *Ibid.*

STRAUB'S (627) patient took three grammes of quinine at a single dose. Three hours later he was very ill and blind. Marked œdema of the retina was found with the ophthalmoscope. Three weeks later pupillary reaction returned and twelve days later perception of light. The visual fields were very narrow. Gradual improvement. WESTHOFF.

MICHEL (628) gives a clinical and anatomical report on four cases of disease of the central artery and vein. In the first case there was the ophthalmoscopic picture of embolism of the central artery. There was found in general an extensive atheroma of the arteries of the body, as well as hypertrophy of the left ventricle. Death occurred five weeks later. An endarteritis proliferans of the central artery was found, the intima being everywhere thickened. Just behind the lamina cribosa the lumen was blocked apparently by a thrombus.

In Case 2, of albuminuric neuro-retinitis with numerous hemorrhages and white patches, the central artery contained a thrombus.

In Case 3, the central vein contained a thrombus extending through its entire course in the optic nerve..

Michel concludes that the picture of so-called embolism of the central artery can be produced by thrombotic stoppage of the artery. Thrombosis follows endarteritis proliferans, but it is possible that the changes in the intima may alone cause the blocking.

Thrombosis of the central artery may arise in two ways : either in the form of a marantic or of a pressure thrombosis. Hemorrhagic retinitis may be caused (1) by a marantic thrombus of the central vein ; (2) by phlebitis blocking the lumen ; (3) by an extensive affection of the veins of the retina, particularly those of middle calibre, in the form of phlebitis proliferans with narrowing or closure of the lumen. In 1 the veins are enlarged and tortuous ; in 2 and 3 the veins are rather narrowed.

The ophthalmoscopic picture of albuminuric retinitis is the expression of circulatory changes and lesions of the tissues of the retina caused by a primary arterio- or phlebo-sclerosis of the central vessels.

SEYDEL'S (629) patient, a woman of thirty-one, after a short walk suddenly noticed a cloudiness of vision in the right eye. Many of the veins were markedly tortuous and at points enclosed in chalky white sheaths, so that the vessel appeared like a white stripe. There were numerous hemorrhages. The picture resembled that described by Michel as sclerotic and atheromatous degeneration of the retinal vessels.

The author further described a typical partial embolism in a woman of twenty-seven. There was a milky-white opacity of the retina in the region supplied by a small vessel whose blood column was seen to be interrupted.

OLE BULL (630) believes that the pathological changes ophthalmoscopically visible in the retina have not been sufficiently studied and not enough attention has been given to them. Many cases of visual disturbance after trauma are due to spasmodic conditions of the retinal vessels. Ophthalmoscopically one sees at times partial contractures which change from day to day. Analogous changes may occur when the vessels are diseased without a preceding trauma. The author believes that the so-called syphilitic choroiditis depends upon primary changes in the retinal vessels. DALÉN.

SCHROEDER (631) presents a critical review of the literature concerning the pathogenesis and therapy of spontaneous detachment of the retina. As to pathogenesis he distinguishes :

I. The secretion theory (Arlt and others).

II. The shrinkage theory (H. Müller and others).

III. The diffusion theory (Raehlmann and others).

IV. The new Deutschmann theory.

Therapeutics are divided into operative and non-operative. In the former category, he described the mechanical treatment by a bilateral-pressure bandage introduced by Samelsohn in 1875, and the Heurteloup leech, inunction treatment, and particularly diaphoresis.

The operative treatment goes back about forty years to puncture of the retina proposed by von Graefe in 1857, followed by puncture of the sclera with the purpose of allowing the escape of the subretinal liquid (Sichel, v. Graefe), and later continued drainage, particularly that by means of de Wecker's gold wire. In conclusion he describes in detail the operative procedures of Schöler and Deutschmann.

Silex (632) describes: 1. A case of bilateral incomplete homonymous hemianopsia coming on at once. The patient, a man of sixty-two, on arising one morning suddenly saw everything veiled. There was a small field downward in each eye, including the point of fixation. 2. Two cases of minimal central field of vision in advanced optic-nerve atrophy. 3. Ring scotoma. A man of fifty-two had acquired syphilis twenty-four years before. Only near the disc was there a slight indication of sclerosis of the choroidal vessels. In each eye was a ring scotoma easily demonstrable, of fairly equal size, and remaining unchanged after an interval of six months.

Raehlmann (633) states that all the cases of so-called total color-blindness which have been subjected to physiological investigation had diminished acuteness of vision and other disturbances. In fact all these eyes were pathological. Therefore Raehlmann's examination of a case of total color-blindness in eyes otherwise normal is of great importance; the results of his detailed examination, however, cannot be satisfactorily presented in an abstract.

In the eye examined by Druault (634) the retina was detached up to the ora serrata and ruptured above. On the anterior surface of the retina, downward, near the ora serrata, was a network of capillary vessels several layers deep. The vitreous had undergone a fibrillary degeneration and was tightly adherent to the retina where the vessels lay. This case illustrated the

effect of vitreous traction upon the retina. No choroidal changes which could have caused the shrinking of the vitreous were found. v. MITTELSTÄDT.

In the case reported by BURNETT (635), a man of eighty-five was suddenly blinded in the right eye. Seen a few hours after the accident, the fundus presented a typical picture of so-called embolism of the central retinal artery. There was some vision left, principally down below and to the right. The peculiar vascular changes as observed through a year, were the obliteration of the principal arteries, hemorrhages in the retina, and afterwards refilling of old vessels or formation of new ones, and clumps of small capillaries along the lines of the obliterated arteries, and not at the seats of the former hemorrhages.

BURNETT.

FOX (636) reports a case of eye injury from electric-light flash from a current of 500 volts. There was momentary blindness, after which the man continued his work, and during the evening read the newspaper. At midnight he was awakened by great pain, and when seen by Fox at that time, there was much congestion of the conjunctiva and some redness of the lid and a pinhole pupil. Under cocaine the symptoms soon subsided and recovery was rapid. Fox discusses the various theories that have been advanced to account for the phenomena, and concludes that the most plausible one is that there is an intense irritation of the retina from the light rays, causing an instantaneous hypercontraction of pupil and ciliary muscle, followed by a temporary paralysis of the ciliary nerves.

BURNETT.

In GIFFORD'S (637) case the patient was found to be blind after an operation on the tonsil of the left side, which necessitated the ligation of both carotids and the jugular vein. Gifford found a typical picture of so-called embolism of the central retinal artery. He thinks that, like similar cases reported by Siegrist, Graefe, and others, the closure of the retinal vessel is due to a thrombosis starting at the point of ligation in the vessels of the neck.

BURNETT.

PATILLO (638) reports two cases of poisoning by methylic alcohol in two painters who were working in the fumes in a confined space. In one case the total blindness lasted for a week, then sight returned somewhat, but finally gave way to only p. l. in one eye, and finger-counting at three feet in the other. In his

partner the sight gradually improved from total blindness to fingers at one and three feet respectively. Retinal vessels normal, discs white. BURNETT.

MOORE (640) reports three cases of hysterical blindness in the male sex; one of both eyes, the other two of one eye each. They presented the typical picture of the affection as seen in women. All three were cured by producing a sudden shock on the nervous system, once by a strong electric current, twice by etherization, the patients being positively assured beforehand that a cure would result. BURNETT.

In the case given by NELSON (641) a man was standing by a dynamo while a thunderstorm was raging. During a flash of lightning he was thrown down, and remained unconscious for some minutes. On recovery he was unable to see, nor could he bear the light to fall on the eyes, so great was the photophobia. Pupils were much contracted, and there was a conjunctivitis and keratitis which persisted, as did the photophobia, for weeks. It was more than ten weeks before he could do even light work. The final recovery, however, was perfect. BURNETT.

XX.—OPTIC NERVE.

642. MENDEL. On section of the optic nerves. *Deutsche med. Wochenschr.*, Nov. 6, 1899, p. 991.

643. SEGGEL. A cured affection of the chiasm with remarks on the location of the nerve fibres in the chiasm. *Arch. f. Augenheilk.*, xl., p. 53.

644. DALÉN. Optic neuritis and acute myelitis. *Graefe's Archiv*, xxviii., p. 672.

645. BAAS. The origin of choked disc. *Zeitschr. f. Augenheilk.*, ii., August, 1899.

646. WEEKS. The papillitis of brain tumor. *Journ. Amer. Med. Assoc.*, Dec. 23, 1899.

Rupture of the optic nerves without injury to the eyeballs is rare, according to MENDEL (642), but when it does occur the clinical picture is as clean-cut as after an experiment on animals. The optic nerve is a portion of the brain pushed forward, and its fibres once divided never reunite (Gudden's law). The ophthalmoscopic picture differs according to the location of the rupture, whether close to the ball and involving the central artery or

farther back in the orbit. When the rupture occurs near the ball, a picture is seen resembling that following embolism of the central artery. Mendel reports a case of rapier injury of the nerve farther back in the orbit. The sight was lost at once, but the fundus was normal. The temporal half of the disc began to grow pale ten days later. The injury may take place at the apex of the orbit or in the bony canal. Changes in the disc are then longer delayed. The complete blindness which appears at once may be recovered from wholly or in part, but often the eye remains blind. A definite prognosis cannot usually be made directly after the injury.

SEGGEL (643) reports the case of a woman of twenty-three in whom he found in both temporal halves of the visual fields, besides an absolute peripheric defect, a larger temporal-hemianopic defect. Since the smell was normal and there was a paresis of the left oculomotor nerve, it was assumed that there was pressure on the posterior portion of the chiasm probably due to inflammation. Under treatment with iodide of potassium the defect in the fields grew less until only a symmetrical relative paracentral scotoma remained. Fifteen months later there was a relapse and almost the entire temporal halves of the fields were lost, but finally there was almost complete recovery.

In a detailed paper DALÉN (644) described a case of acute myelitis with optic neuritis observed in Professor Fuchs's clinic in Vienna. The association of these two conditions was first described by Erb in 1879. A healthy man after exposure suddenly experienced a disturbance of vision in his left eye and a fortnight later in his right. A month later the lower extremities became paralyzed, and there soon developed the picture of acute ascending myelitis, which caused the patient's death three weeks later. At the autopsy there was found myelitic softening of the lumbar and dorsal portions of the cord, and a lesser degree of softening of the cervical portion, while the medulla and brain macroscopically exhibited no changes.

The medullary sheaths of the intraorbital portion of the left optic nerve, of the intracranial portions of both nerves, the chiasm and neighboring portions of the tracts had completely disappeared. There were numerous fatty granular cells present and marked interstitial changes.

BAAS (645) gives a good résumé of the various theories offered to explain the development of choked disc. He takes a middle

ground between the Schmidt-Manz œdema theory and the Leber-Deutschmann inflammation theory.

A consideration of 677 published cases of choked disc leads WEEKS (646) to the opinion that this symptom is of value only when there are other corroborating symptoms of brain tumor. He reports the results of the microscopic examination of five cases of his own, in all of which the intervaginal space was distended. He believes that there are two forms of papillitis—one an œdematous form such as was found in his cases, and the other a true inflammatory form.

BURNETT.

XXI.—INJURIES, FOREIGN BODIES, PARASITES.

647. BRANDENBURG. A contribution to the subject of gun-cap injuries of the eye. *Sammlung zwangloser Abhandlungen*, iii., part 4, Halle, C. Marhold.

648. JOHNSON. Report of a case of removal of steel from the eyeball and exhibition of a new portable magnet. *Ophth. Record*, Nov., 1899.

BRANDENBURG (647) reports a case of injury from a gun-cap. There was a small clean wound in the upper lid corresponding to a wound at the upper margin of the cornea. The vitreous was so cloudy that no reflex was obtained. On the third day a 3-*mm* long splinter of copper presented in the wound in the lid and was removed. This seemed to nullify the diagnosis of foreign body within the eye, but as chemosis developed and a yellow reflex was obtained from the interior and accommodation in the other eye became affected, enucleation was done on the thirteenth day. A second splinter of copper was found imbedded in pus in the vitreous.

JOHNSON (648) reports the successful removal of a piece of steel from behind the iris by a new magnet which he exhibited. The size of the instrument is not given. The cone is made of soft Norway iron and wound to 140 ohms resistance with No. 28 single silk-covered magnet wire, one half in one direction, the other half in the other, the two coupled by two bottom wires. The conduction cord is attached to the ordinary Edison plug.

BURNETT.

XXII.—OCULAR DISTURBANCES IN GENERAL DISEASES.

649. PRAUN and PRÖSCHER. A further case of acromegaly and investigations on metabolism in this disease. *Graefe's Archiv*, xlviii., p. 375.

650. VOSSIUS. On the inheritance of ocular diseases, with particular reference to optic neuritis in consequence of heredity and congenital disposition. *Sammlung zwangloser Abhandlungen*, iii., part 6, Halle, C. Marhold.

651. BIHLER. A case of lead amblyopia. *Arch. f. Augenheilk.*, xl., p. 274.

652. WALLER. On skin and eye affections in persons who work with hyacinth bulbs. *Zehender's klin. Monatsbl.*, xxxvii., p. 480.

653. MEYER. A case of abortion for albuminuric retinitis. *Zeitschr. f. Augenheilk.*, ii., Oct., 1899.

654. WINTERSTEINER. A contribution to the subject of injuries to the eye during birth. *Ibid.*, ii., Nov., 1899.

655. SCHWARZ. On hemiopic pupillary reaction. *Ibid.*, Dec., 1899.

656. HEILMAIER. A contribution to the subject of the relation of ocular to nasal affections. *Ibid.*

657. WALTON and CHENEY. Tumor of the pituitary body. *Boston Med. and Surg. Jour.*, Dec. 7, 1899.

658. SEITZ. Anomalous pupillary reaction in meningitis. *Med. Record*, Dec. 2, 1899.

659. BRUNSON. Relative frequency of iritis in syphilis and rheumatism observed in three thousand cases. *Ophth. Record*, Nov., 1899.

660. VAUGHAN. Malarial infection as a factor in causing eye disease. *N. Y. Med. Jour.*, Dec. 16, 1899.

Last year PRAUN (649) presented two cases of acromegaly to the Ophthalmological Society. He now reports, with PRÖSCHER, a third case. The patient was a woman of thirty-five, who had noticed enlargement of her body for ten years. There was pallor of the temporal halves of the discs and concentric contraction of the visual fields. In two of these cases investigations in regard to metabolism were undertaken. It was found that the amount

of nitrogen given off was diminished but that otherwise metabolism was normal.

Vossius (650) observed three cases of typical retrobulbar neuritis of hereditary origin, in two brothers and a nephew. Their uncle and two great uncles had been affected similarly, only the male members of the family having the disease. None of the patients became entirely blind. Vossius offers the usual explanation that there might be narrowing of the optic canal from hyperostosis due to inflammation.

Bihler (651) describes a case of hemiachromatopsia due to lead poisoning. Three similar cases have been described. It is probable that the optic tract was affected. The author made an examination of the optic nerves of a man with lead poisoning in whom amaurosis had developed suddenly. There was no considerable atrophy of the optic nerves. The etiology of lead amblyopia is still obscure.

In the Haarlem tulip nurseries it is found that in August and September the workmen often suffer from an irritation of the skin and eyes. The dust from dry bulbs had been credited with causing the irritation. Waller (652) found in this dust numerous worms and hard needle-shaped crystals. The larvæ of these worms develop in August and September and doubtless bore into the skin and die there.

In the fourth month of her second pregnancy, Meyer's (653) patient developed an albuminuric retinitis and vision failed rapidly to R V = $\frac{1}{100}$, L V = $\frac{1}{30}$. In the next three days the vision failed further and an abortion was induced. The albumen in the urine diminished, but vision remained reduced to perception of movements of the hand.

Wintersteiner (654) examined microscopically the eyes of an infant that had been delivered with forceps. The conjunctivæ were suffused and the anterior chamber filled with blood. The redness of the conjunctivæ gradually passed off, but hemorrhages from the nose continued, and the infant died a week after birth. At the autopsy a fracture of the ethmoid bone was found and lesions of the mucosa of the ethmoid cavities.

Microscopically, numerous hemorrhages were found in the ciliary bodies and in the suprachoroidal space anteriorly. The hemorrhages usually found in the eyes of the new-born are in the posterior segment of the ball, and these hemorrhages, localized to the anterior segment, were doubtless due to the pressure of the forceps.

SCHWARZ (655) criticises Silex's statement that hemiopic pupillary reaction, a symptom highly regarded by the neurologists, in fact does not exist. Strictly speaking, Silex is right, since it is impossible to prevent an excitation of the functionating half of the retina by reflected light. But one is justified in speaking of a hemiopic pupillary reaction where a marked difference in reaction is noticed with illumination of each half of the retina. The examination must be very carefully made and Haab's cortical reflex excluded.

HEILMAIER (656), from the records of the Wurzburg clinic for eight years, deduces the following conclusions:

1. Diseases of the tear passages are regularly accompanied or caused by disease of the nose, most frequently atrophic rhinitis.
2. The eczematous diseases of the eye are regularly associated with eczema of the nasal mucosa.
3. Conjunctivitis and its complications may be caused by various diseases of the nose.
4. Serpent ulcer of the cornea is usually accompanied only by the nasal affections found together with dacryocystoblennorrhœa.

In the case reported in great detail by WALTON and CHENEY (657), the patient, a man of twenty-six when the disease first manifested itself, was affected with acromegaly and peculiar eye symptoms. These latter were, aside from dimness of vision, attacks of temporary hemianopsia associated with migraine. Later there was a permanent hemianopsia involving first the temporal field of one eye, and later extending to the nasal field of the other. There was loss of color sense (hemiachromatopsia) in the otherwise unaffected field of one eye. A tumor involving the sella turcica was found, 2.7 *cm* by 3.5 *cm* by 3 *cm*, and pressing on the chiasm. Unfortunately the chiasm, nerves and tracts were not removed for examination. BURNETT.

The anomalous condition of the pupil in SEITZ's (658) case is that in a patient affected with tuberculous meningitis the pupils opened widely under intense light and contracted in darkness. No explanation is offered. BURNETT.

BRUNSON (659) has gathered statistics from physicians practising in Hot Springs, Ark., as to the relative frequency of iritis in syphilis and rheumatism, taking 1500 cases in each disease. He finds 48 cases of iritis in 1500 cases of syphilis, and 23 cases in the same number of rheumatic patients. BURNETT.

VAUGHAN (660) relates some cases in which he considers that malaria played a part in the production of the eye symptoms. In one case there was a fluctuation in the visual acuteness having quite a periodic character. This disappeared on administration of quinine. In another case there was a marked ptosis of one eye, associated with congestion of conjunctiva and diminished visual acuteness. These also disappeared on the administration of quinine. BURNETT.

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